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Collective Reviews

LATERAL CERVICAL CYSTS, SINUSES, AND FISTULAS OF CONGENITAL ORIGIN

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Discussion of the precise origin of the many lateral anomalies of the neck region has been carried on since von Ascherson first related these clinical findings to the branchial apparatus in 1832 (2). In contradistinction to the midline cervical anomalies, about which there is general agreement as to origin, investigators have found many points of disagreement through the years in regard to the lateral lesions. This is not difficult to understand, inasmuch as the branchial apparatus is but a transient stage in the development of the human embryo, first appearing in the embryo of 2.6 millimeters and having disappeared in the embryo of 14.0 millimeters, a time interval of approximately 40 days beginning at about the tenth day of gestation.

THE BRANCHIAL APPARATUS—HISTORICAL

The first accurate description of the embryology of the branchial apparatus in vertebrates was published in 1825 by Rathke (61, 62, 63). His findings were based on the branchial arch and cleft structures of the pig embryo of 3 weeks' gestation, and were homologized with similar structures in the aquatic animals. Von Baer, in 1827, described four branchial clefts in the human embryo and, in 1832, von Ascherson (2) related these clefts to the clinical cervical anomalies.

Cusset (11, 12, 13), in 1877, stated that in man the development of the first arch is seen by the fifteenth day, and that of the fourth arch by the first half of the second month. The arches arose in the region of the base of the skull and ran obliquely downward, forward, and medially. Each tended to fuse with the similar arch of the opposite side.

Histologically, the arch was composed of mesoderm lined internally with cylindrical epithelium and covered externally with flat epithelium. Because of the rapid growth of the first arch, the lower arches were forced downward into the neck region. He stated that growth was more rapid on the external surfaces, with resulting obliteration of the clefts between the arches and disappearance of their lining epithelium. He also thought that if the epithelium did not disappear before this fusion, pathological conditions might result. He found that all of the clefts were closed before the end of the second month.

From the Tumor Service, Department of Surgery, New York University—Post Graduate Medical School

In 1881, His (25, 26, 27, 28) studied human embryos by wax reconstruction technique. From his studies he was able to determine more exactly the precise position of each of the arches. He stated that the first arch grew rapidly and joined the arch of the opposite side anteriorly in the midline. The lower arches were separated progressively further in the young embryo, forming a triangle which he termed the mesobranchial field. As growth took place, the upper arches were seen to enlarge more rapidly, with the result that externally the second arch overlay the third, and the third the fourth, while internally the reverse was true. In this way the third and fourth arches became covered by the overgrowth of the second to form a pocket in the lateral wall of the neck, termed by His as the "praecervical sinus."

At the beginning of the second month, when the growth of the branchial apparatus stops, the entrance to the sinus was seen to be triangular, with its base below and point above. At this time it was bounded anteriorly by the overhanging edge of the second arch, inferiorly by the chest wall, and posteriorly by the lateral wall of the neck.

In the embryo from 11 to 12 millimeters in length, this opening was seen to have disappeared. His also found that the ectodermal and entodermal layers lining the cleft and pouch, respectively, came in close contact in certain stages of growth, with only a small amount of mesoderm separating the pharynx from the exterior. He postulated that rupture of this membrane might occur in rare cases and thus give rise to fistulas.

G. Born (4, 5), in 1883, working with pig embryos, found a blind prolongation of the third pouch covered by several layers of pavement epithelium which he considered to be the thymus anlage.

Von Mall, in 1887, stated that in birds and higher vertebrates he could find no evidence of breakthrough of the dividing membrane, and that the pharynx was always separated from the exterior by this membrane composed of two epithelial layers. He also felt, however, that in rare instances perforation of this membrane might take place.

In 1888, Piersol (55) published a study of rabbit embryos. He stated that in mammals the pharynx was always separated by an epithelial membrane from the exterior, but thought that breakthrough might occur in the second pouch. He also noted ventral prolongations of the first three pharyngeal pouches, from which epithelial formations were seen to grow.

Von Leissner (42), in 1889, after a study of chick and sheep embryos, stated that patency of the pharyngeal pouch and branchial cleft exists in all animals, while Hammar (19), in 1902, stated that in the 5.0 millimeter human embryo the second pouch was patent bilaterally.

Wenglowski (71, 72), in 1912, published his detailed study based on serial section and wax reconstruction of 78 embryos. He found that the development of the branchial apparatus took place in the second half of the first month and that all evidence of these structures, as such, had disappeared by the first half of the second month. He confirmed the findings of His in regard to the mesobranchial field. However, he did not agree with His that the branchial clefts and pharyngeal pouches coincided in length and direction, but found that each branchial arch and cleft crossed each pharyngeal arch and pouch. Thus the epithelial membrane separating the pharynx from the outside existed only in the small area where these structures crossed. This contact point occurred in the lateral portions of the pouches and clefts. There were no perforations of the membrane in any of the well preserved embryos studied.

A considerable portion of Wenglowski's studies had to do with the development of the thymus gland. Stieda (67), in 1881, had thought that the thymus arose from the third or fourth cleft, while Born (4, 5), in 1883, ascribed it to the third pharyngeal pouch. Wenglowski's sections and reconstructions showed the thymus anlage as a group of cells originating in the ventral horn of the third pharyngeal pouch, in close association with the epithelium of the base of the sinus cervicalis. In many sections it could not be determined whether these cells belonged to the pouch or sinus.

As the thymic canal descended, it ran laterally from the pharynx to its point of intimate contact with the sinus cervicalis, then coursed downward, crossing the lateral thyroid anlage (derived from the ventral horn of the fourth pouch), and descended into the chest region.

In the embryo from 12 to 13 millimeters in length, Wenglowski noted that the tract of the pharyngothymic duct coursed from the pharynx outward and downward, coming close to the

skin of the neck. At this point it lay close to small cysts, the remnants of the sinus cervicalis. From here it ran downward, forward, and medially, lying on the outer, posterior sides of the lateral lobes of the thyroid gland.

In the 14 millimeter embryo he noted small cysts along the course of the upper third of the duct, lined with ciliated epithelium. Again he confirmed the fact that the upper third of the duct was lined with ciliated columnar epithelium, while the lower two-thirds were lined with squamous epithelium with islands of ciliated epithelium.

By the 16 millimeter stage, regression of the thymic duct was seen to have taken place. This proceeded to completion in the ensuing stages, usually by the second or third month. Wenglowski believed that if rests of the thymic anlage persisted to the third or fourth month of embryonic life, they would persist indefinitely. These rests histologically showed hollow spaces lined by either squamous or ciliated epithelium, the former type of epithelium being found in rests near the sternum, and the latter in rests near the pharynx.

Wenglowski also examined 10 adult bodies and 65 infant bodies, doing serial sections of the necks. In 2 of the adult bodies he found cysts lined with ciliated epithelium. In 21 of the infant necks, rests were found, 12 of which were in the lower half of the neck, 7 in the upper half, and 2 close to the pharynx. Histologically these were small cysts, sometimes lined with ciliated epithelium and sometimes with squamous epithelium.

Kingsbury (35), in 1915, gave further details of the development of the pharynx in man, essentially agreeing with the findings of Wenglowski. He emphasized that the mesoderm of the pericardium remained in contact with the branchial tissue, especially in the case of the developing thymus. He also brought out the early migration of the vascular arches in a dorsal direction, showing that the first arch moved out on the second, the second out on the third, and the third out on the fourth. He found that while the third vascular arch moved dorsally, the third pharyngeal pouch grew ventrally to reach the cervical sinus, thus altering the relations of these structures. Similar changes occurred in the fourth complex where the fourth pouch was passed in a caudal direction by the fourth vascular arch.

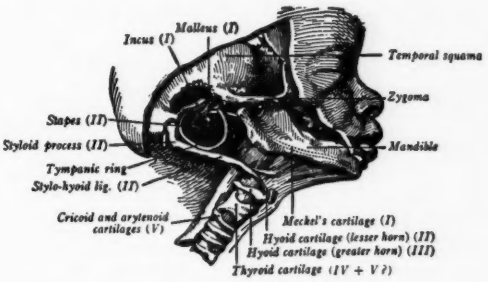

Fig. 1. (After Arey). Showing fate of branchial arch cartilages.

Further contributions to the knowledge of this region were made by Frazer (17), in 1926, and Norris (53, 54), in 1937 and 1938. The latter, in his classic descriptions of the development of the thymus, parathyroids, and lateral thyroid, confirmed for the most part the work of Wenglowski and Kingsbury, and added further details concerning the microscopic development of these tissues.

EMBRYOLOGY OF THE BRANCHIAL APPARATUS

Concepts of the plan of development of the intricate head and neck region have changed little since the early decades of the present century. It is now generally known that at about the fifteenth day of gestation the branchial apparatus develops as five bars of mesoderm, separated by grooves or clefts. These structures are covered externally by flat epithelium and lined internally by columnar epithelium.

At the point of crossing of the cleft and pouch the pharyngeal cavity is separated from the outside by a thin membrane formed by these two epithelial layers. This membrane persists in the case of the first pouch to form the tympanic membrane. By the first half of the second month of gestation the clefts and pouches disappear as such, save for the first which persists as the external auditory canal and eustachian tube (17, 54).

Each arch contains a central cartilage, and through each arch runs a blood vessel and a nerve.

Cartilaginous derivatives. The *first arch* grows more rapidly than the rest and becomes quite massive (FIG. 1). It divides into two portions, the upper, or maxillary, giving rise to the upper jaw and the lateral parts of the upper lip and cheek, and the lower, or mandibular, giving rise

TABLE I.—(AFTER AREY). MESODERMAL DERIVATIVES OF THE BRANCHIAL COMPLEXES OF THE EMBRYO

	I	*II*	*III*	*IV*	*V*
Skeleton	Maxillary process	Stapes	Hyoid (greater horn)	Thyroid cartilage	Thyroid cartilage (?)
	Mandibular process	Styloid process		Thyrohyoid ligament (?)	Corniculate, arytenoid, and cricoid cartilages
	Sphenomandibular ligament	Stylohyoid ligament		Cuneiform cartilage	
	Malleus, incus	Hyoid (body and lesser horns)			
Muscles and their nerves	Muscles of mastication	Muscles of expression	Pharynx (in part) (N. IX)	Pharynx and larynx (in part) (N.X.)	Larynx (in part) (N.X.)
	M. digastricus (ant. belly)	Auricular			
	M. tensor tympani (N. V)	Epicranial			
		M. digastricus (post. belly)			
		M. stylohyoideus			
		M. stapedius (N. VII)			
Aortic arches	(?Stapedial A.)	(?ext. maxillary A.)	Common carotid Internal carotid, proximal portion	Left: arch of aorta Right: subclavian (in part)	Pulmonary artery Ductus arteriosus (arch 6?)

to the lower jaw, lower lip, and chin. The contained rod of cartilage of this arch, known as Meckel's cartilage, extends from the symphysis menti to the tympanic cavity and forms the portion of the mandible which develops from intracartilaginous bone, the sphenomandibular ligament, and two ossicles (malleus and incus) (15, 31, 43, 69).

The cartilaginous portion of the *second arch* (Reichert's cartilage) ossifies at the two extremities, forming the lesser cornu of the hyoid bone anteriorly and the styloid process posteriorly, the intervening portion persisting as the stylohyoid ligament (69). It is generally felt that the portion of the stapes other than the base is derived from the cartilage of the second arch, although its base develops as intramembranous bone.

The cartilage of the *third arch* forms the greater cornu of the hyoid bone.

Most probably the cartilages of the anterior portions of the fourth and fifth arches go to make up the skeletal elements of the larynx, the fourth forming the thyroid and cuneiform cartilages and perhaps the thyrohyoid membrane, the fifth forming the corniculate, arytenoid, and cricoid cartilages (16, 31) (Table I).

Vascular derivatives. In the human embryo, six aortic arches appear on either side of the pharynx, arising from the ventral aortic arch and curving posteriorly through the branchial arches to reach the dorsal aorta. In the lower animals these pairs of vessels form the vascular network of the gills, five or more arches being present in fishes, and three or four in the tailed amphibians. In human beings, however, there is a reduction in number along with extensive transformation to accommodate air breathing (9) (FIG. 2).

The period of development of the aortic arches extends throughout the fourth week, and their transformation occurs mainly in the fifth to seventh weeks (9, 20).

The vessels of the first and second arches disappear early, being replaced by new mandibular and stapedial vessels. It is stated by some that the origin of the external maxillary artery marks the anterior end of the first arch, and the origin of the lingual artery marks the anterior end of the second.

The vessel of the third arch remains and, because of atrophy of the dorsal aorta between the third and fourth arches, becomes the base of the primitive internal carotid. The external carotid arteries are new outgrowths of the aortic sac which move their bases up onto the third arches and thus form the common carotid as the landmark of the ventral extremity of the third arch vessel.

The fourth arch vessel on the left persists and enlarges to form the major portion of the permanent arch of the aorta, while the right fourth arch vessel becomes the right subclavian.

The fifth arch vessels are inconstant and transitory, and disappear after the 7.0 millimeter stage.

The sixth or pulmonary arches form the main pulmonary vessels and lose contact with

the dorsal aorta, except for the left which remains as the ductus arteriosus (Botallo) and later the ligamentum arteriosum (Table I).

Neural derivatives. The nerve tissue contained in the first arch becomes the third division of the fifth nerve while that in the second arch becomes the seventh, or facial nerve. The third arch nerve becomes the ninth, or glossopharyngeal, and the fourth arch nerve, the superior laryngeal. The inferior laryngeal nerve reaches the larynx from the vagus by passing caudal to the sixth aortic arch, thereby explaining the position of the recurrent nerves, passing beneath the ligamentum arteriosum on the left and the subclavian artery on the right (Table I).

Muscular derivatives. Extensive migration of the muscles occurs in the face and neck region. However, it is possible by referring to the nerve supply of these muscles to relate them in development to each particular arch. Thus, the muscles derived from the first arch (those innervated by the mandibular nerve) are the muscles of mastication: the mylohyoid, the anterior belly of the digastric, the tensor veli palatini, and the tensor tympani. Those from the second arch (innervated by the seventh nerve) are the muscles of facial expression (including the occipitalis and the platysma): the stapedius, the stylohyoid, the posterior belly of the digastric, and at times the palatoglossus and styloglossus. Those of the third arch (innervated by the ninth nerve) are the stylopharyngeus and some of the soft palate muscles. The fourth arch (innervated by the superior laryngeal) gives rise to some of the soft palate muscles, the constrictors of the pharynx, and the cricothyroid, while the fifth arch (recurrent laryngeal) is the origin of the intrinsic muscles of the larynx (Table I).

Other derivatives. It is usually stated that the dorsal wing of each first pharyngeal pouch expands during the eighth week to form the tympanic cavity of the middle ear, whereas the rest of the pouch is drawn out into the auditory tube. Frazer (16), however, has claimed that the tubotympanic region absorbs the second arch and pouch and is then bounded caudally, in part, by the third arch. At this time also, the first cleft deepens to form the external auditory canal, with the intervening sheet of epithelium forming the tympanic membrane (58, 65, 74).

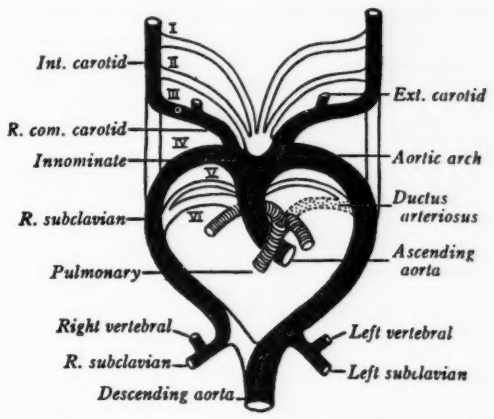

Fig. 2. (After Arey). Showing fate of primitive vascular structures.

The *palatine tonsil* develops in the area of the second pouch, probably from the entoderm of the pouch itself. The crypts arise progressively in the fetus of 3 to 6 months as solid ingrowths from the epithelium. Lymphocytes appear in the third month and organize as follicles after the sixth month (48, 59).

The *thymus* develops as follows: The ventral ho ns of the third pouch thicken and, together with squamous epithelium from the sinus cervicalis, grow downward and medially, in close association with the posterolateral aspect of the developing thyroid gland. The lower ends become attached to the pericardium and gradually sink with this structure into the thorax. During this descent the upper portions of the ducts disappear (14, 19, 38, 54, 71, 72, 73).

Parathyroid glands. The dorsal wing of each third and fourth pouch thickens into a solid mass of cells that is prominent in the 10 millimeter embryo. The pair from the third pouch (parathyroid III) is drawn down by the thymus anlage to the level of the caudal border of the thyroid gland. The pair from the fourth pouch (parathyroid IV) remains at the cranial thyroid border (53) (Table II).

Thyroid gland. The main mass of the thyroid gland develops as a midline structure projecting downward from the pharynx between the first and second pharyngeal arches. This point of origin is indicated in adult life by the foramen cecum. In the seventh week the gland becomes crescentic in shape and settles to a transverse

TABLE II.—(AFTER AREY). ENTODERMAL DERIVATIVES OF THE BRANCHIAL COMPLEXES OF THE EMBRYO

	I	*II*	*III*	*IV*	*V*
Pharyngeal pouch	Epithelium of: Tympanic cavity	Epithelium of: Palatine tonsil and fossa	Thymic reticulum and corpuscles	Superior parathyroid	Ultimobranchial body
	Tympanic membrane (int. surface)		Inferior parathyroid		
	Mastoid cells				
	Auditory tube (thyroid arises in midplane at about this level)				
Entodermal lining of arch	Epithelium of: Body of tongue and much of mouth	Epithelium of: Root of tongue Pharynx	Epithelium of: Root of tongue Pharynx Epiglottis	Epithelium of: Root of tongue Pharynx Epiglottis	Lungs arise in midplane at about this level

position with a lobe on either side of the trachea (51, 52). It is thought by some that the ventral horn of the fourth pharyngeal pouch grows downward, forward, and medially as the lateral thyroid anlage, and contributes tissue to the lateral thyroid lobes (53, 56) (Tables II and III).

LATERAL CERVICAL ANOMALIES

Cervical fistulas were first described by Hunczowski (29) in 1789. However, all discussions of the embryological origin of anomalies in the lateral neck region are dated to the publication, in 1832, of studies by von Ascherson of all the cases of lateral cervical anomalies available at that time (2). His conclusion was that these lesions resulted from failure of closure or of obliteration of the branchial clefts. He also thought that the cervical sinus, covered by the "operculum branchiale" as described by Rathke (61, 62, 63), played a part in their formation.

Heusinger (21, 22, 23), in 1864, stated that the internal orifice of all the lateral fistulas was situated at the lateral wall of the pharynx at the base of the tongue. He believed that the external orifice determined which cleft was at fault, ascribing one case with the external opening at the sternoclavicular junction to persistence of the fourth cleft. On this basis, Bland-Sutton and von Cusset (11, 12, 13) devised charts, according to which one might determine from which cleft a given fistula arose.

His (25), in 1885, stated that the finding of an opening pointing into the cervical sinus from the exterior was normal up until the fifth week of gestation, and that the thymic anlage lay between this sinus and the depth of the third pharyngeal pouch. He postulated that rupture of this closing membrane in this region might give rise to anomalies persisting into adult life. At this time he believed that the thymus arose from the floor of the cervical sinus, but in 1889 (27) changed his mind and stated that the thymic anlage arose from the ventral aspect of the third pharyngeal pouch, agreeing with Born (4, 5).

Rabl (57, 58), in 1887, stated that the second cleft was most likely to be the causative factor inasmuch as the fourth cleft was separated from the cervical sinus by a thick mesodermal layer and the third cleft was concerned with the formation of the thymus, and fistulas were not found to be in close relation to this structure. He believed the fistulas were formed by a breakthrough in the thin layer of epithelial cells separating the second pouch from the cervical sinus.

In 1890, Kostanecki and Milecki (36, 37) reviewed and discussed the literature up to that time. They believed that the external opening did not indicate the pouch involved as the inner opening was always to be found in the same place—in the lower tonsillar fossa near the base of the tongue. Therefore they ascribed most of these anomalies to the second pouch. However, they felt that no complete fistula could result from the pouch alone, since the limiting membrane must first be ruptured, with a break into the cervical sinus. Watson, Karewski, and Hildebrand (24, 33, 34) had reported a case in which the fistula ran through, and in the course of, the stylopharyngeus muscle, and, since this muscle develops from the third arch, they had ascribed it to the third pouch. Kostanecki and Milecki thought that this did not invalidate their theory, as the muscles develop somewhat later than the branchial apparatus. Apparent discrepancies arise because of developmental

TABLE III.—(AFTER AREY). ECTODERMAL DERIVATIVES OF THE BRANCHIAL COMPLEXES OF THE EMBRYO

	I	*II*	*III*	*IV*	*V*
Branchial cleft	Epithelium of: Ext. auditory meatus Tympanic membrane (ext. surface)	Lost in cervical sinus	Lost in cervical sinus	Lost in cervical sinus	Lost in cervical sinus
Ectodermal covering of arch	Epidermis of tragus Maxillary process: Epidermis of upper lip and cheek Enamel; parotid gland Mandibular process Epidermis of lower lip and jaw enamel Submaxillary gl. Sublingual gl. Epithelium of: Vestibule, gum, and palate	Epidermis of auricle upper neck	Epidermis of middle neck	Lost in cervical sinus	Epidermis of lower neck

time lags in which the earlier formed structures migrate before certain later structures appear.

In 1912 Wenglowski (71, 72) published the results of his painstaking work in serial section study of 75 embryos and 246 cadavers. The embryos ranged in size from 2.0 to 49 millimeters and were studied extensively by serial section and wax reconstruction technique. As a result of these studies, Wenglowski believed that the majority of the lateral cervical anomalies did not come from the second pouch and cervical sinus but arose from the pharyngothymic duct. In support of this idea he placed importance on the internal opening of the fistulas. If the lateral fistulas belonged to the second groove or pouch, then the opening would have to be within the boundaries of the pouch, that is, between the palatoglossal arch as an anterior border and the palatopharyngeal arch as the posterior border. A study of the cases reported showed that the internal orifices did not lie between these boundaries. On the other hand, the cases of Kostanecki and Milecki, Kosztowski, Kotalicki, Neuhofer, Mobitz, Watson, and others revealed the internal extremity of the fistula to be found at the base of the tongue, in the tonsillar fossa behind the palatopharyngeal arch. Inasmuch as the palatopharyngeal arch and the underlying muscles belong to the third arch, he believed that the origin of the fistula was much more closely related to the third pouch than to the second.

The second important point brought out by Wenglowski was that the external openings of the fistulas and the primary locations of the lateral cysts were in a constant, predictable pattern. They were always found to lie along the medial border of the sternomastoid muscle, from the styloid process to the middle of the sternum. Therefore, he ruled out suppuration as a determining factor in the production of the external opening in the cases of fistulas, as, in that situation, the openings might be expected to lie lateral to the sternomastoid, or even open into the pharynx or esophagus.

The third point in Wenglowski's discussion was his statement that the branchial apparatus is bounded on the inferior margin by the hyoid bone in the adult. Therefore, he argued that the fistulas, most of which open far inferior to this level, must have another origin than the pharyngeal pouch alone. This origin he believed to be the thymus anlage and the pharyngothymic duct. In support of this theory he showed rests of tissue and cystic spaces along the tract of the thymic duct in the embryo and in dissections of the necks of infants and adults.

In the ensuing years investigators and writers on this subject have continued to discuss the precise origin of these anomalies, some favoring the thymic origin (Wenglowski, 71, 72; Meyer, 46), others the pharyngeal pouches (Kostanecki, Milecki, 36), and the sinus cervicalis (Hyndman, Light, 30; Bailey, 3; Ladd, Gross, 40).

CLINICAL FEATURES

The present series comprises 67 patients with lateral cervical anomalies from the Tumor

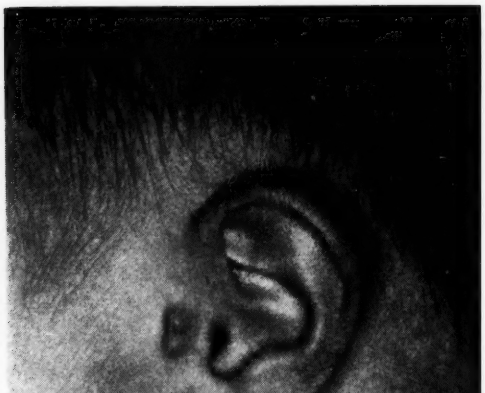

Fig. 3. Preauricular cartilaginous remnant (accessory tragus).

Service, Department of Surgery, New York University Post Graduate Medical School, for the 20 year period from 1932 through 1951. All of these patients were treated surgically, and the microscopic pathology was avilable for review. Midline cervical anomalies for this same period have been discussed in a previous publication (66).

Anatomical relationships divide these lesions into several categories, and it is on this basis that the present series of cases will be analyzed (Table IV).

Auricular lesions. Congenital anomalies of the auricular area include malformation of the auricle, auricular and preauricular sinuses, fistulas and cysts, skin tabs, and cartilaginous remnants. The origin of these anomalies may be found in the embryology of the developing external ear. This structure develops around the first branchial groove, from tissue furnished both by the first branchial arch (mandibular) and the second arch (hyoid). During the sixth week six hillocks appear on these arches, three on the caudal border of the first, and three on the second arch. There is doubt as to the exact fate of these hillocks, but in the main it is agreed that the auricle is formed by a remodeling procedure from this tissue (65, 68). Some believe that the entire auricle, except the tragus, is of second arch origin (74). Defective combination of the primordial parts is responsible for the variously malformed auricles.

Clinically the sinuses and skin tabs are obvious from birth. The skin tabs and cartilaginous rests present few problems, and no symptoms. The chief reason for removal is cosmetic, and they are usually not associated with other malformations in this local area. Many times these formations are excised under local anesthesia before the infant is discharged from the nursery, or are removed in the outpatient surgery clinic. No cases of this anomaly are formally included in this series, although many patients have been treated in this manner. These patients have presented small rounded nubbins of cartilage, covered by integument and lying just anterior to the tragus (FIG. 3). Microscopically they have consisted of normal-appearing skin, cartilage, and connective tissue.

Sinus openings are most commonly found on the helix (FIG. 4) with a pinpoint opening leading to a shallow tract. They are small and, unless infection has supervened, produce few symptoms. As the vast majority of these lesions are shallow pits rather than complete fistulas there is little discharge, although occasionally a small amount of sebaceous material may be expressed. Cysts in this area are almost always found in the preauricular region and may or may not be associated with a sinus opening. They are usually small when first seen, from 0.3 to 0.7 centimeter, and are nontender and slightly mobile. However, infection is common, and they usually present with pain, tenderness, and other signs of inflammation (FIG. 5).

In the present series there were 10 cases of preauricular lesions, sinus openings being present in 6 cases and cystic formations in 4. There were no complete fistulas. The sinus series was made up of 2 females and 4 males. In 4 of the cases the sinus was unilateral, and in 2, bilateral. Both of the bilateral lesions were present in males. The ages of the patients varied from 1 year to 10 years, averaging 4.8 years. All of the openings had been present from birth. Three patients had had treatment prior to being seen in the clinic. Incision and drainage of infection had

been performed on these patients, and one of them had had a subsequent excision with recurrence. In the 4 patients with unsightly scars or infection, treatment was by complete excision of the cutaneous opening and the subcutaneous tract. The tract was noted to be from 1.0 to 1.5 centimeters in length. In the 2 remaining cases, both bilateral, there were associated lower cervical anomalies requiring surgery, and the preauricular lesions were not excised (asymptomatic). Pathologically, the excised area showed a sinus tract lined by squamous epithelium with varying amounts of inflammatory infiltration.

The 4 preauricular cysts were found in 1 male and 3 female patients, aged from 5 to 38 years, with an average of 13.0 years. The duration of symptoms in these cases ranged from 1 month to 5 years, averaging 1.3 years. Two of the patients had had previous treatment; one was subjected to excision of a cyst 3 years prior to admission and the other to incision and drainage on two occasions, followed by x-ray therapy. Both of these patients presented with drainage and cystic swelling in the preauricular area. The other patients showed cystic masses varying from

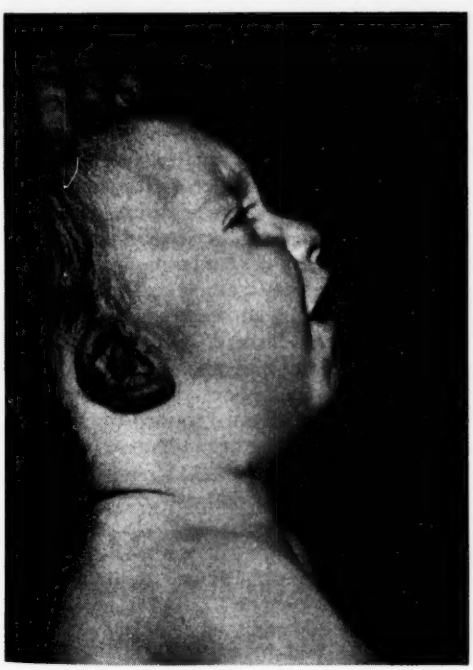

Fig. 4. Sinus opening on helix occurring in patient with complete lateral fistulas (see Fig. 7).

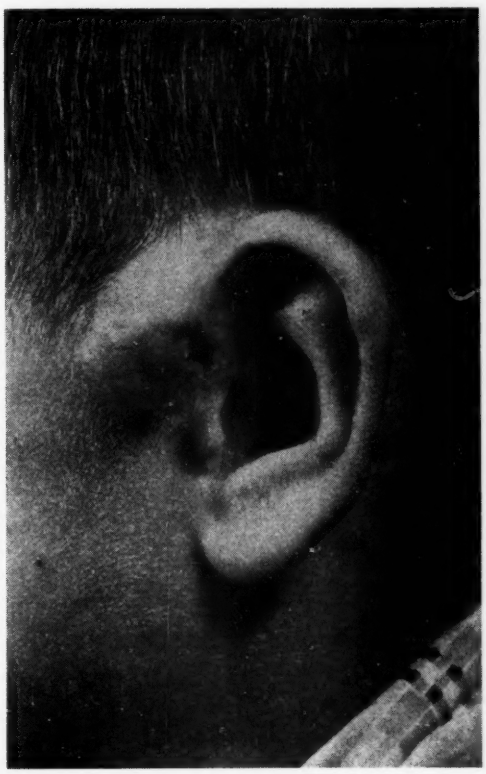

Fig. 5. Infected preauricular cyst.

1.0 and 1.5 centimeters in diameter. Treatment consisted of complete excision of the cyst and tract in all of the cases. Pathologic examination showed cystic cavities lined by stratified squamous epithelium, except in the cases in which severe inflammation was present and the cyst lining had been destroyed. Beneath the epithelial layer were found lymphoid tissue, connective tissue, and varying amounts of acute and chronic inflammatory infiltration.

Anomalies of the first branchial cleft. Among all the anomalies of the lateral neck region, those ascribable to the first branchial cleft with relation to the external auditory canal, or middle ear, have been the rarest reported. Bailey (3) does not mention any such case in several articles on the subject. Hyndman and Light (30), in a review of 90 cases, found one suggestive of this lesion. Ladd and Gross (40), in a review of 82 cases in 1938, found one child with a sinus which led to the external auditory canal. Neel

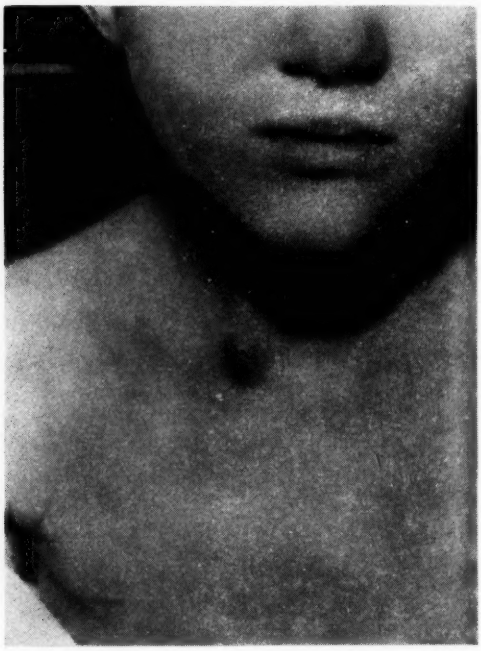

Fig. 6. Complete lateral fistula with infection and abscess formation.

and Pemberton (49), reviewing the Mayo clinic series of 319 cases in 1945, found no first cleft lesions. Recently Byars and Anderson (6) reported 3 cases, 2 cysts and 1 sinus, with tracts to the ear canal. Rankow and Hanford (60), in a review of 167 cases of lateral anomalies, found 3 cases, 2 cysts and 1 sinus.

The present series reveals 4 lateral cysts from which tracts led to the external auditory canal. The presenting symptom in each of these 4 cases was the presence of a swelling in the upper neck. Examination revealed a cystic mass lying behind and beneath the angle of the jaw. The patients included 1 male and 3 females, their ages ranging from 15 to 45 years, with an average age of 34.2 years. Swelling had been present in these cases (3 known) for 4 months, 13 years, and 15 years, respectively. Two of the patients had had previous treatment, consisting in one case of aspiration only, and in the other of two excisions with recurrence. The cysts varied in size from 2.0 to 5.0 centimeters, averaging 3.1 centimeters. Treatment consisted of excision of the cyst with its tract down to the auditory canal. In 1 case it was noted by the operator that the tract ran through the substance of the parotid gland. Microscopically the lesions showed squamous epithelium, sebaceous glands, and hair follicles, beneath which were focal lymphocytic infiltrations and varying degrees of inflammatory infiltration. It is interesting to note that in none of these cases was there any recorded ear discharge. There were no complete fistulas in our group. Discharge from the external ear in the presence of cysts or sinus openings in the upper neck has been considered a diagnostic point in cases of first cleft anomalies (6, 60).

Fistulas of the neck. Complete fistulas of the lateral neck are always evident at birth. The presenting complaints are usually those of persistent or intermittent drainage from a small orifice in the neck. Swelling of the neck may be present in those cases associated with cysts, and infection occasionally supervenes (FIG. 6). The cutaneous orifice is always located on a line along the anterior border of the sternomastoid muscle, and in the great majority of cases is in the lower one-third of the neck. It presents a tiny round or slitlike opening, sometimes associated with a small pigmented area in the surrounding skin, and occasionally accompanied by a skin tab which may contain cartilage. Pressure above the opening usually causes exudation of a drop of mucoid or cloudy fluid. Palpation of the orifice and deeper tissues above may reveal the presence of a small cystic swelling, or a cordlike structure running upward toward the pharynx. An occasional case has been reported in which a

TABLE IV.—SUMMARY OF CASES

Type of anomaly	*No. of cases*	*Male*	*Female*	*Average age (years)*	*Average duration symptoms (years)*
1. Preauricular lesions	10	5	5	8.9	3.1
2. First cleft lesions	4	1	3	34.2	9.3
3. Fistulas (complete)	6	4	2	6.3	6.3
4. External sinuses	2	1	1	21	21
5. Internal sinuses	4	3	1	33	0.3
6. Cysts	37	20	17	32	2.4
7. Cartilaginous rests	4	0	4	8.5	8.5
Total	67	34	33		

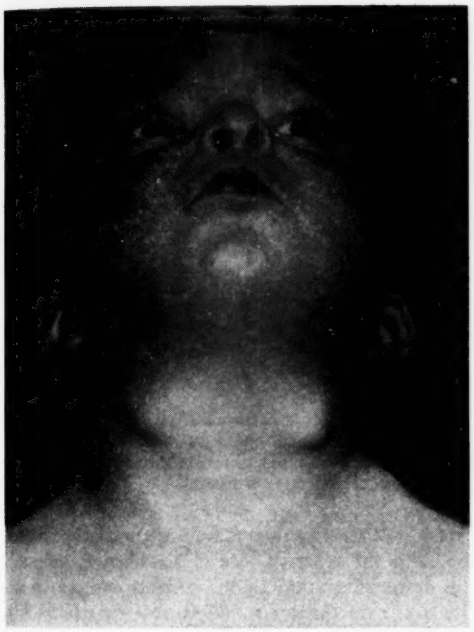

Fig. 7. Bilateral complete fistulas with cystic dilatations; patient also showed bilateral auricular pits (see Fig. 4).

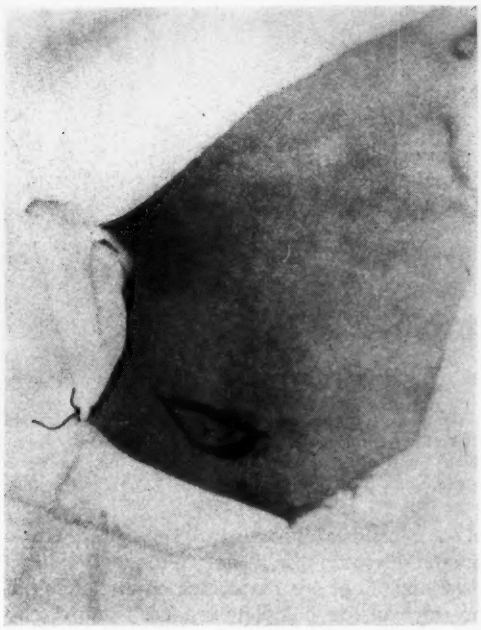

Fig. 8. Left complete fistula. Operative technique. Transverse elliptical incision about external orifice.

dry, irritating cough has formed a part of the symptomatology. Carp (7) noted such an instance in a 5 year old boy whose cough was relieved by excision of the tract. Proximity of the fistula to the vagus nerve has been considered responsible for this symptom.

Reports of the exact course of these fistulas in reaching the pharynx from the lower neck have been conflicting in some regards. However, most collected series show the following:

The tract runs from the external opening through the subcutaneous tissue, the platysma muscle, and the superficial layer of the deep fascia. It then courses upward on the carotid sheath until it reaches the suprahyoid level. At this point it turns rather abruptly beneath the stylohyoid and posterior belly of the digastric muscle and in front of the hypoglossal nerve in the direction of the pharynx. The internal opening is found uniformly in the region of the base of the tonsillar fossa. In reaching the pharynx most authorities agree that it usually passes between the internal and external carotid arteries. The relation to the ninth nerve (glossopharyngeal) is not as definite, some stating that it passes posterior to this structure (46), while others feel it courses superficial to it (3, 40, 64). Watson, Karewski, and Hildebrand (24, 33, 34) cited 1 case in which the tract traversed the stylopharyngeus muscle, but this apparently has not been a common finding, most investigators noting entrance to the pharynx above this level at the base of the tonsillar fossa.

In the present series of cases there were 6 patients who exhibited complete lateral cervical fistulas. Four of these were male and 2 female. The ages of these patients ranged from 1 year to 12 years, with an average of 6.3 years. One case showed bilateral fistulas (FIG. 7). All of the lesions had been present since birth and were located in the lower third of the neck. In 2 cases there were also bilateral preauricular sinuses (one of these presented bilateral cervical fistulas). In this entire series of lateral anomalies these were the only cases which showed lesions in more than one location. This finding was also reported by Hyndman and Light in a family in which the mother and 3 of 5 children presented both cervical fistulas and preauricular sinuses. It is possible to infer that the presence

Fig. 9. Left complete fistula. Operative technique. Note that the tract has been dissected to the level of the hyoid bone, where a second transverse incision has been made.

Fig. 10. Left complete fistula. Operative technique. Tract delivered through upper incision. Dissection completed to pharynx. Tract transected flush with pharyngeal wall. No ligation is necessary.

of complete fistulas in the lower neck indicates a greater degree of disturbance in the embryologic development of this general region than does the presence of less complete lesions. None of the patients in this group had had previous treatment.

Treatment consisted of excision of the fistulous opening and removal of the complete tract through two transverse incisions (FIGS. 8 to 12). In 3 cases cysts were encountered in the course of the tract (FIG. 13). Microscopically, the tracts showed lining epithelium of columnar type, often ciliated, throughout the major portion of their length. The distal extremity of the tract revealed stratified squamous epithelium. Lymphoid tissue was uniformly present beneath either type of epithelial lining, and there were varying amounts of inflammatory reaction.

External sinuses (complete external, incomplete internal tracts). The present series revealed 2 cases which could be classed as complete external, incomplete internal tracts. One patient was male (FIG. 14) and the other female (FIG. 15), aged 28 and 14 years, respectively. In both patients the abnormality had been noted at birth. The first patient revealed a 1.5 centimeter papillary mass in the lower third of the right neck, with a 2.0 millimeter sinus opening just lateral to this at the anterior border of the sternomastoid muscle. The second patient presented a 2.0 millimeter sinus opening over the left sternoclavicular joint with a 5.0 centimeter cystic swelling beneath it. Treatment in each case consisted of excision of the cutaneous lesion, the sinus opening, and the tract. There was no tract deep to the cystic dilatation in the second case, and in the first case the tract ended at a depth of 2.0 centimeters. Histologically, the second case showed the cyst to be lined with ciliated columnar epithelium beneath which lymphoid follicles were found. In the first case the tract showed a lining made up partially by stratified squamous epithelium and partially by stratified ciliated columnar epithelium. Lymphoid tissue was prominent in the deeper layers.

Internal sinuses (complete internal, incomplete external tracts). Four cases were found which exhibited this type of anomaly, 3 males and 1 female. Their ages ranged from 9 years to 57 years, with an average of 33 years. Symptoms had been present from 1 to 6 months, an average of 3.2 months. The presenting complaint in all of these cases was a swelling in the neck, while in 2 cases a draining sinus had persisted following incision and drainage. The cystic masses were noted to be at the anterior border of the sternomastoid muscle in the middle and upper third of the neck, varying from 2.0 to 3.2 centimeters in diameter, and they were indistinguishable from those cysts in which no tract was found, as described in the following section. Treatment consisted of complete excision of the cyst and tract to the pharynx. The course of these tracts was noted to be similar to the course taken by the complete fistulas described. The microscopic appearance did not differ from that

of the other cystic lesions, there being both stratified squamous epithelium and stratified columnar epithelium (sometimes ciliated), beneath which lay lymphoid tissue.

Lateral cervical cysts. The greatest proportion of cases fell into this category, there being 37 patients in whom a cyst alone was found. In this group were 17 females and 20 males, whose ages ranged from 8.5 to 76 years. The average age for the entire group was 32 years. The presenting symptoms in all of the cases were those referable to swelling in the neck, always noted to be in the region of the anterior border of the sternomastoid muscle. In most cases the swelling was in the upper portion of the neck, beneath the angle of the mandible. In addition, 4 patients complained of draining sinuses, the result of previous surgical procedures.

The duration of symptoms in these cases varied from 3 weeks to 15 years, the patients having noted swelling on the average of 2.4 years prior to admission. The cysts ranged up to 9.0 centimeters in diameter and occurred on either side of the neck. The average size of the cysts in this group was 4.3 centimeters. Previous treatment had been given in 8 of these cases. In 1 patient aspiration alone had been done. In 3 patients incision and drainage (three times in 1 case) had been attempted and in 3 other patients excision had been performed with subsequent recurrence. One patient had had x-ray therapy. Treatment in all cases consisted of complete excision of the cyst with careful search for a proximal tract. None was found in any case. Microscopically the findings were similar to cysts in the other categories, there being both squamous and columnar epithelium in some cysts, squamous epithelium only in some, and columnar epithelium in others. At times cilia were noted. Lymphoid tissue beneath the epithelium was a constant finding (FIGS. 16 and 17).

Fig. 11. Left complete fistula. Operative technique. Appearance of wounds following removal of tract.

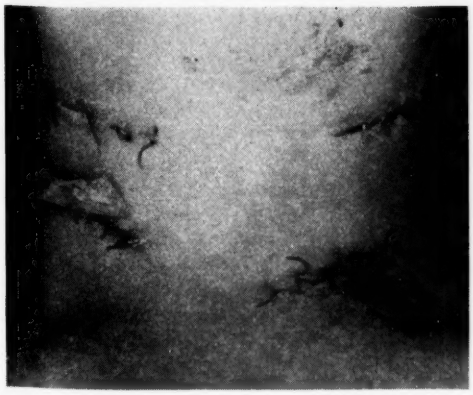

Fig. 12. Bilateral complete fistulas. Drains placed behind posterior belly of digastric muscle and brought out through lower incision.

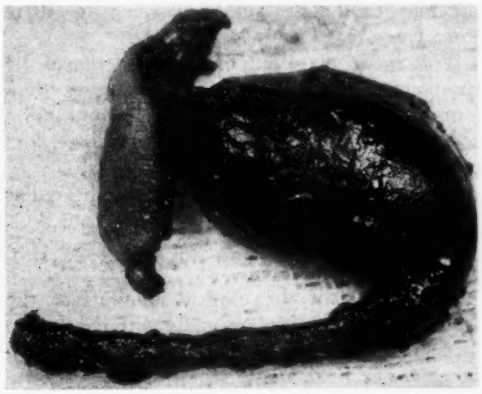

Fig. 13. Complete fistula showing cystic dilatation of the tract (approximately one and one-third times the actual size).

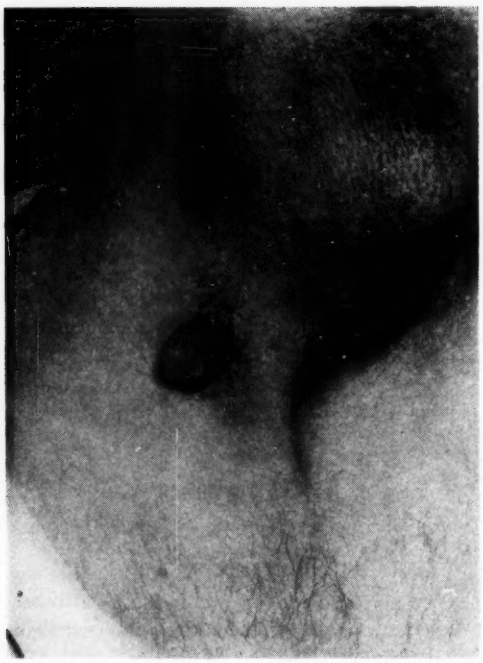

Fig. 14. External sinus associated with congenital pigmented skin tab.

Cervical cartilaginous rests (cervical auricle). Four patients presented this interesting anomaly. They were all females, ranging in age from 3 to 12 years, with an average age of 8.5 years. In all cases the lesions was located in the lower third of the neck and had been noted at birth. No previous treatment had been given in all of these cases.

Treatment consisted of simple removal by transverse elliptical incision. No sinuses were found in any instance. Microscopic examination revealed normal appearing skin, cartilage, and connective tissue (FIG. 18).

A summary of the pertinent facts in this entire series appears in Table IV.

DISCUSSION

Correlation of the clinical findings of the many forms of cervical anomaly with the known facts in regard to development of the neck region in man has been made in various ways since von Ascherson's first attempt in 1832 (2). Conclusions have varied as more information has been accumulated. It would seem proper at this time to re-evaluate our knowledge of these clinical findings and embryologic studies.

Anomalies in the preauricular area can be attributed to lack of fusion, or faulty fusion, of the structures adjacent to the dorsal extremity of the first branchial cleft. These structures give rise to the external ear (58, 65, 74). Present analysis can add no further suggestion as to the origin of this group of lesions.

Other anomalies of the first cleft, so designated by connection to the auditory canal, also seem to be well confirmed as to their site of origin (6, 60), although the second cleft may be implicated if Frazer (17) is correct in his findings that this cleft is absorbed into the tubotympanic region.

Other cervical anomalies. It is in the case of the remaining lateral anomalies that the developmental steps have not been as clear, and it is with this group of anomalies that the present discussion will be concerned.

Although Wenglowski (71, 72) and Meyer (46) claimed that lateral cysts, complete fistulas, and partial ducts below the level of the hyoid were derived from the pharyngothymic duct and that only those anomalies above this level could be attributed to the branchial system, evidence is at hand that branchial development has importance in areas well below the hyoid. Entodermal lining of the pharynx as far down as the cricopharyngeal pinchcock (perhaps also the lining of the larynx) has been shown to be of embryonic pharyngeal origin. It is now believed that the skeletal elements of the larynx and associated

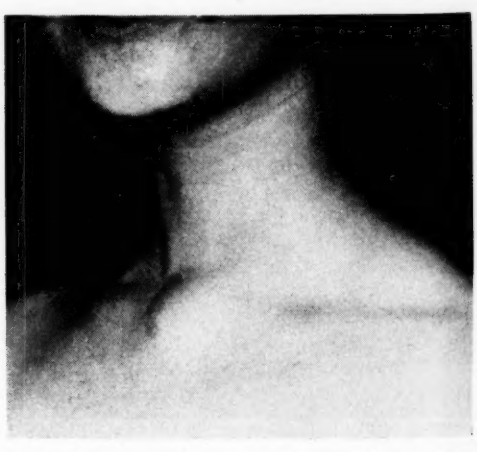

Fig. 15. External sinus overlying sternoclavicular joint with cystic swelling.

cartilages are derived from the cartilages of the lower branchial arches (16, 31). The vascular content of these arches goes to make up the common carotid artery, the arch of the aorta, the subclavian vessel, and the ligamentum arteriosum, structures far caudal to the area in question (9, 20). The glandular structures derived from the pharyngeal pouch system again demonstrate this caudal migration, thus giving the adult location of the thyroid, thymus, and parathyroids (14, 19, 38, 51, 52, 53, 54, 56, 71, 72, 73). It is of importance to determine the distribution of the nerve fibers to the skin of the neck. Authorities are agreed that the cutaneous sensory supply to the major portion of the auricle, an area embryologically derived from the second arch, is from the great auricular nerve, arising from cervical roots two and three. Study of the neck region shows that the anterior neck, medial to a line corresponding to the anterior border of the sternomastoid muscles, is also supplied by cervical roots two and three via the cutaneous colli nerve. The skin lateral and posterior to this line is supplied from roots three and four, thus indicating a higher origin for the midanterior cervical area. Of great importance is the location of skin tabs and cartilaginous rests of the neck. These lesions are always located along the anterior border of the sternomastoid muscle and are counterparts of the preauricular cartilaginous rests. It is indeed hard to deny their origin from branchial arch structures.

It is difficult to envision the clinical cervical anomalies as arising from the lower portion of the pharyngothymic duct as suggested by Wenglowski (71, 72). The course of the thymus gland in its descent has been well documented (Wenglowski, 71, 72; Kingsbury, 35; Norris, 51, 52, 53, 54), and it is generally believed that from its origin, in close contact with the cervical sinus, it migrates downward and ventrally on the posterolateral surface of the thyroid, and is intimately associated with the pericardium in this process. The descent of parathyroid III follows this path, because of its origin in the same area of the third pharyngeal pouch (53), stopping in its migration at the lower part of the lateral thyroid lobe. One might expect if the lower part of the pharyngothymic duct were instrumental in the production of the lateral anomalies, that cysts or fistulas would be found in relation to this path of descent. This, however, is not the case. Cysts and sinuses of this type have never been found attached to the pericardium or bearing the expected relation to the thyroid or parathyroid glands. It is also difficult to explain by this theory the cutaneous orifice of the sinus and fistula, as the thymus tract follows the deep position already described and lies deep to the sternum and strap muscles. The only point of superficial contact of the thymus tract is in the area of the cervical sinus.

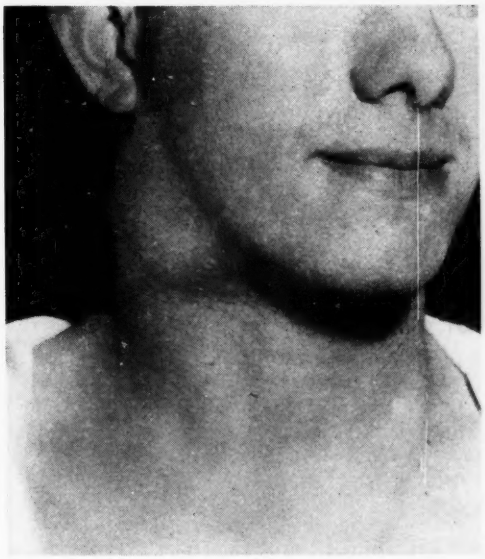

Fig. 16. Lateral cervical cyst, preoperative.

Persistence of the cervical sinus opening, however, explains the location of the fistulas. Investigators of embryology have determined the lower boundary of the embryonic cervical sinus to be the chest wall, thus placing this opening at the lower level of the branchial area. It is recalled that there is clear evidence of the high origin of the superficial tissues in the anterior portion of the neck, bounded laterally by the line of the anterior border of the sternomastoid muscles. Skin tabs and cartilaginous rests occur in this region, and the cutaneous innervation of this portion of the integument arises from a higher level than that of the more lateral neck, indeed from the same level as the innervation of the major portion of the external ear, a known second arch derivative. Persistent cervical sinus openings would then lie in the lower third of the neck, between the anterior borders of the sternomastoid muscles.

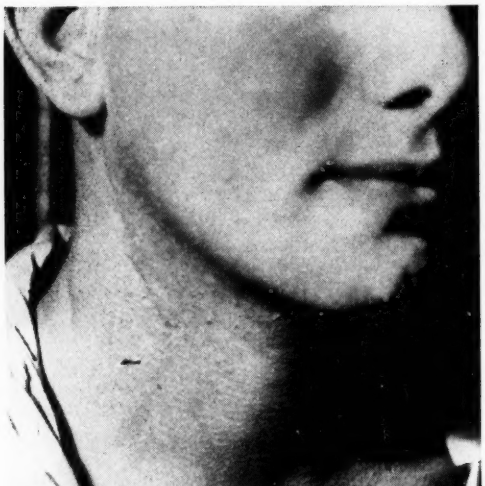

Fig. 17. Lateral cervical cyst, postoperative. (Incision should be made in a more transverse direction following skin creases.)

Thus it is possible to explain the definite clinical differences in the various locations of lateral neck anomalies. Those anomalies with connection to the skin (complete fistulas, external sinuses, skin tabs, and cartilaginous rests) are found consistently in the lower third of the neck between the sternomastoid muscles, occasionally over the manubrium itself. The integumental connection, controlled by the embryonic position of the opening of the cervical sinus, is the factor which holds these anomalies in the lower neck during the upward growth of the head structures. Conversely, those anomalies without connection to the skin (internal sinuses, and cysts) are consistently found in the upper third of the neck at about the level of the hyoid bone, the same level at which the complete fistula changes direction to run inward to the pharynx. These anomalies, not fixed in location by the cervical sinus opening, participate in the upward growth of the head region and remain in the relative location of the pharyngeal pouch. Undoubtedly the upper portion of the tract is formed by the persistence of pharyngeal pouch structures.

The internal orifice of the fistula lies in the inferior portion of the tonsillar fossa, a structure formed from the second pharyngeal pouch. However, some investigators have stated that the internal orifice often lies posterior to the palatopharyngeal arch, a third arch derivative. The fistula lies behind the stylohyoid muscle and the posterior belly of the digastric muscle, a position which either second or third pouch derivatives could assume. Relationship to the glossopharyngeal nerve, a third arch derivative, is apparently inconstant. The fistula is uniformly described as running between the internal and external carotid vessels, a relationship which the second pouch would retain.

Microscopically, the anomalies show columnar epithelium (occasionally ciliated), squamous epithelium, and lymphoid follicles. These findings are those expected from a disturbance in the area of contact of pharyngeal pouch and cervical sinus. Rests of columnar epithelium alone, of squamous epithelium alone, or of both intermingled are frequently observed in this area in the embryo, and have been found in dissections of the necks of infants and adults (71, 72). Thus, although the final decision as to origin of the upper portion of the complete fistulas cannot be made, the greater weight of evidence would seem to indicate that they arise

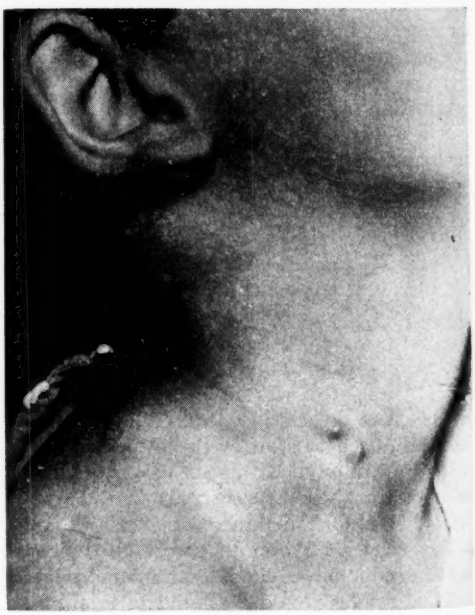

Fig. 18. Cervical cartilaginous rests. Note relation to anterior border of sternomastoid muscle.

from the second pharyngeal pouch. The lower portion apparently derives from the persistent cervical sinus. The complete fistula, therefore, results from the breakthrough of the limiting membrane.

SUMMARY

The present knowledge of the embryology of the branchial systems in man has been reviewed and the history of the discovery of this knowledge is noted. A series of 67 patients exhibiting 70 lateral cervical anomalies has been analyzed and discussed. Theories as to the origin of these clinical entities have been historically reported. The importance of the cervical sinus in the development of these anomalies has been emphasized. The crucial point of skin attachment in the ultimate location of these structures has been stressed.

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NONOPERATIVE TREATMENT OF PERFORATED PEPTIC ULCER; A FURTHER REPORT

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NONOPERATIVE TREATMENT of perforated peptic ulcer has continued to attract much attention since the first report of successful management of a case by Redwood (21) in 1870. Since that time, with the emphasis placed on gastric decompression by Wangensteen (29), chemotherapeutic agents, antibiotics, and better knowledge of fluid and electrolyte balance, many series of patients have been deliberately treated in this manner as evidenced by the large collection of Taylor (27), and the excellent comparative study of Heslop, Bullough, and Brun (12). It is the purpose of this article to add a series of 139 patients to the growing list of nonoperative cases, and to summarize available reports on this method of treatment in an attempt to make a comparison of the results with those obtained in operative cases during the same time period.

Nonoperative therapy of this condition is based upon the premise that a perforation will close itself, provided the stomach is kept empty in order that nothing passes through the opening and the patient is given adequate supportive treatment. Even when early operation is performed, it is the rule, rather than the exception, to find that a perforation has been sealed by direct apposition to nearby structures. The surgeon then tears down this effective natural seal to confirm the diagnosis and replaces it with one of his own ingenuity. In these cases operation probably has done little good and has exposed the patient to complications incidental to the anesthesia, laparotomy, exploration, and the reclosure of the perforation. In this connection, Cohn and Mathewson (6) reported on 3 patients who recovered satisfactorily following an exploratory operation in which a sealed ulcer was found and left undisturbed.

In addition to preventing these unwanted sequelae of operative treatment, the nonoperative regimen will occasionally avert an unnecessary and perhaps harmful operation resulting from a mistaken diagnosis. Another advantage of conservative treatment has been advanced by Heslop *et al.* (12), who feel that the patient who has recovered from his perforation without operation is able to return to his work much earlier than one who has been operated upon.

The apparent advantages of the nonoperative method of treatment have caused many observers to give it serious consideration because of the substantial mortality and morbidity in the operative approach. In a few clinics (17, 24, 27) nonoperation is the treatment of choice; in others (12) it is an adequate alternate to surgery. In most institutions nonoperation is reserved for those patients who are seen several hours after perforation and in whom there is evidence that sealing has occurred, or who present some serious contraindication to surgery (6, 16, 26, 28). All observers who have had experience with the nonoperative method agree that it should be undertaken only under the close supervision of an experienced surgeon and that careful attention to the details of the treatment is essential.

ANALYSIS OF CASES

This series consists of 139 patients with perforated peptic ulcer treated by the nonoperative method from October, 1945 through December, 1953. The first 110 cases have been reported previously (24). One hundred and nine patients were treated consecutively in two general hospitals. The remainder were cared for in other establishments by former residents and associates of the senior author. Although the patients in this series were definitely better off economically than the "skid row" cases of Schmitz, Harkins *et al.* (22), they should not be considered a highly selective group, since the available population included many veterans and elderly retired personnel whose environment was not in any sense controlled.

Diagnosis. The classical diagnosis of perforated peptic ulcer would require elicitation of a pre-

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vious ulcer history, acute symptoms of perforation, definite physical and laboratory findings, roentgenographic evidence of pneumoperitoneum, and subsequent demonstration of the ulcer or its effects at operation or on gastrointestinal x-ray studies. Frequently several of these criteria are absent, yet the diagnosis is usually made correctly on the basis of the clinical picture and one or more confirmatory laboratory procedures.

Although all criteria were not present in all cases in this series, a clinical diagnosis of perforated peptic ulcer was made in every case by the examining surgeon. In 97.8 per cent of the patients this diagnosis was confirmed by demonstration of free air in the peritoneal cavity, by positive findings in the convalescent gastrointestinal x-ray series, or, in those patients who came to elective surgery for chronic ulcer, by operative demonstration of the sealed ulcer. The following tabulation indicates the basis of diagnosis in the 139 cases:

Pneumoperitoneum present.	109	(78.4%)
Pneumoperitoneum absent..	30	(21.6%)
Positive barium study or operation.....	27	(19.4%)
Clinical diagnosis only.....	3	(2.2%)

Of the 30 patients who had no free air on admission, 7 had had previous perforations and 6 gave no previous history of ulcer. In 27 patients, healing ulcers or deformed duodenal bulbs were visualized on gastrointestinal x-ray studies made shortly after recovery, or were demonstrated later at elective operation. Of the 3 cases diagnosed by clinical means only, the initial x-ray report was not available in one and follow-up gastrointestinal x-ray studies were omitted in the other two. Two of these had definite ulcer histories, and in one the ulcer had previously perforated. The 3 patients were seen within the first few hours after perforation. They presented characteristic clinical signs and had leucocyte counts of more than 18,000.

From the given criteria, it was felt that the correct diagnosis had been made in every case. No patient suffered because operation was withheld when a condition existed for which immediate surgery would have been mandatory. On the contrary, the nonoperative approach to conditions mimicking perforated peptic ulcer afforded an adequate and safe period of observation during which the true diagnosis could be established. Thus, unnecessary operation was avoided in 1 fatal case of diffuse hemorrhagic pancreatitis, 1 fatal case of dissecting aneurysm of the thoracic aorta, 1 nonfatal case of coronary occlusion, and 2 nonfatal cases of pancreatitis. During the period of this study 5 patients were operated upon under the mistaken diagnosis of appendicitis and small perforations of the duodenum were closed.

Site of perforation. This appeared to be in the duodenum in 134 cases. Of these perforations, 108 were confirmed by gastrointestinal x-ray studies or at subsequent operation. The remaining cases were diagnosed clinically as perforated duodenal ulcer, but in 17 of them barium x-ray studies were omitted or not reported. In 9 cases convalescent roentgenographic studies revealed no evidence of ulcer. Many small perforations may heal very rapidly and leave no trace on follow-up studies.

Five perforations were proved to be gastric. Three of these responded satisfactorily to nonoperative treatment. One of these, visualized during a routine gastrointestinal series, proved malignant at subsequent elective gastrectomy. Two patients with perforated gastric ulcers, admitted to the hospital in a moribund condition, died shortly after treatment was begun. No conclusions concerning nonoperative treatment in perforated gastric ulcer could be made from these few cases, although it is realized that this condition is a more serious one than perforated duodenal ulcer.

Previous perforation. In 11 of the 139 cases there was a definite history of previous perforation. In 7 of these, no free air was demonstrable, which confirms the fact that adhesions from previous peritoneal insults frequently limit the process when reperforation occurs.

Hemorrhage. Concurrent hemorrhage was observed in only 2 patients. In one it was evidenced by tarry stools and in the other by a moderate degree of hematemesis. In both cases the bleeding ceased spontaneously and was at no time a serious problem.

Age and sex. There were 3 women in the series. The remaining patients were adult men. Although over half of the patients were under 40 years of age, a fair number (23 per cent) were over 50 and 2 were over 70. This distribution is not unlike that of many others reported in recent surveys.

TABLE I.—DISTRIBUTION OF CASES ACCORDING TO TEMPERATURE, PULSE, RESPIRATION, WHITE BLOOD CELL COUNT, AND POLYMORPHONUCLEAR PERCENTAGE AT VARYING INTERVALS AFTER PERFORATION.

Interval—perforation to admission in hours	Temperature (oral F.)			Pulse			Respiration		Leucocytes			% PMN		
	Under 98.6°	98.6°–100°	Over 100°	Under 90	90–110	Over 110	Under 20	20 or Over	Under 10,000	10,000–20,000	Over 20,000	Under 60	60–90	Over 90
0–3	9	7	4	6	12	2	4	19	3	15	3	4	13	4
3–5	21	14	8	18	22	3	12	29	11	27	5	1	40	3
5–8	1	17	11	13	15	0	7	22	2	22	5	1	24	3
8–12	1	7	7	8	5	1	8	6	2	9	2	2	9	3
12–18	2	1	6	1	5	3	0	9	0	8	1	0	7	1
18–24	1	0	3	1	2	1	1	3	0	3	1	1	3	0
Over 24	1	3	3	0	5	1	0	6	1	5	1	2	4	1

The age distribution in this series of 139 patients was as follows:

Age in Years	No. of Patients
18	1
19	3
20–29	51
30–39	31
40–49	21
50–59	20
60–69	7
70–79	2
Not Recorded	3

Duration of ulcer symptoms. Ulcer symptoms preceding perforation were absent in 22 cases and indefinite in 13. Twenty-nine patients had symptoms of less than 1 year's duration, 42 between 1 year and 5 years, while 33 admitted to ulcer histories for more than 5 years. Thus, 75 per cent of the patients had definite histories of ulcers preceding the perforations, while 16 per cent admitted to no previous symptoms.

Interval between eating and perforation. Many of the patients in this series had consumed heavy meals or had imbibed large quantities of alcoholic beverages shortly before perforation occurred. None of our deaths could be related to the full stomach, although it has been stated that nonoperation might be doomed to failure in such cases. The interval between eating and time of perforation is listed below:

Hours	No. of Patients
Less than 1	21
1–3	30
3–5	23
5–8	17
8–12	10
Over 12	10
Not stated	28

Clinical findings. The distribution of cases according to temperature, pulse, respiration, leucocyte count, and neutrophil percentage at varying intervals following perforation is presented in Table I. Normal or subnormal temperatures and leucocyte counts are to be expected very early after perforation and tend to rise as the peritoneal reaction develops. Failure to rise is often associated with a poor prognosis.

Interval between perforation and institution of treatment. The time interval between the perforation and the institution of nonoperative treatment is listed below. In 115 cases, or 83 per cent of the series, treatment was instituted less than 12 hours after perforation, a period considered by many as the "golden hours" for surgical intervention.

Hours	No. of Patients
Less than 1	5
1–3	20
3–5	46
5–8	29
8–12	15
12–18	9
18–24	5
Over 24	7
Not stated	3

Mortality. There were 7 deaths among the 139 cases, an over-all mortality of 5 per cent. An analysis of the deaths is presented in Table II. All of the patients in this series were considered operable at the time of admission with the exception of 5. Four of these were moribund when first seen, while the fifth was in cardiac failure when perforation occurred. These patients all died soon after treatment was instituted. The sixth patient died following cardiac arrest during tracheotomy for laryngeal stricture. This was an elderly hypertensive patient with chronic laryngitis. He was in poor condition when admitted and might well have been considered inoperable in some clinics. It is believed that these last 2 patients would have survived had the unrelated conditions permitted. It was gratifying to find at autopsy that the perforation was firmly sealed and peritoneal reaction was minimal in both cases. The seventh death was that of an elderly man seen 48 hours after per-

TABLE II.—ANALYSIS OF DEATHS

Case No.	*Age*	*Sex*	*Hours perforation to treatment*	*Days admission to death*	*Operability on admission*	*Cause of Death: Autopsy*
1	43	Male	48	6	No (moribund)	Pulmonary embolus; thrombosis femoral artery with gangrene of leg; perforated duodenal ulcer; peritonitis.
2	53	Male	18½	4	No (moribund)	Peritonitis; perforated pyloric ulcer, partially sealed.
3	39	Male	19	1	No (moribund)	Peritonitis; large perforated gastric ulcer.
4	40	Male	9	4	No (moribund)	Peritonitis; three duodenal ulcers, one perforated; bronchopneumonia; uremia.
5	—	Male	1	—	No (cardiac failure)	Myocardial infarction; perforated duodenal ulcer well sealed.
6	67	Male	3	3	Questionable (hypertension, laryngitis)	Cardiac arrest during tracheotomy for laryngeal stricture; perforated duodenal ulcer, well sealed.
7	65	Male	48	18	Yes (operative closure 6th day)	Autopsy not obtained; duodenal fistula; arteriosclerotic cardiovascular renal disease; uremia; severe emphysema.

foration, who could have been operated upon at the time of admission. Under nonoperative treatment the perforation at first appeared to seal satisfactorily, but surgical closure became necessary a few days later. At that time the patient was still in good condition, but death occurred 12 days later from a duodenal fistula. It should be mentioned, however, that this patient might have died from this complication even if he had been subjected to immediate operation. Taylor (27) sounds a warning regarding the patients whom he terms "air-swallowers." Of 4 such in his series, 2 died. Feeling that these patients swallow air more rapidly than it can be aspirated by the ordinary nasogastric tube, he recommends early operation in all cases in which x-rays reveal that pneumoperitoneum is increasing.

Excluding the 5 patients who were inoperable when first seen, there were 2 who died among 134, a corrected mortality rate of 1.5 per cent. This figure is well below the average mortality rate of 12 operative series (Table III), and compares favorably with the best of them. Indeed, our over-all mortality of 5 per cent, which includes patients *who could not have been operated upon*, is less than the 8.7 per cent average figure in the combined series of patients *who were operated upon*.

CASE SUMMARIES OF DEATHS

Case 1. A 43 year old white man who had had symptoms of peptic ulcer for 4 years, suffered perforation of a duodenal ulcer October 3, 1949. At an outlying hospital perforation was not suspected and, although he was given sedation, intravenous fluids, transfusion, and penicillin, gastric decompression was not employed. The following day his right leg was cold from the midthigh downward. He was transferred to an Army general hospital on October 5 when early gangrene of the right leg was apparent. The abdomen was silent, but not rigid, and he was moribund. In spite of oxygen, whole blood, intravenous fluids, morphine sedation, constant gastric suction, lumbar sympathetic blocks, and 600,000 units of penicillin, together with 1 gm. of streptomycin daily, a large abscess developed and this was drained through the right lower abdomen on October 8. Death occurred October 9, 6 days after admission. Examination revealed a perforated duodenal ulcer, severe peritonitis, embolism of the right pulmonary artery, thrombosis of the right femoral artery and vein, and gangrene of the leg.

Case 2. A white man, 53 years of age, had a history of peptic ulcer over a period of 20 years. He was admitted to the medical service at 5 a.m. on February 26, 1950, with a diagnosis of coronary occlusion. He was given nothing by mouth, but no therapy was instituted toward the treatment of the peptic ulcer. Perforation had occurred at 2:30 a.m. Eighteen and one-half hours after perforation he was referred to the surgical service in a moribund state. He was irrational and upon one occasion removed the Levin tube. An overwhelming peritonitis was apparent as evidenced by an oral temperature of 96.4 degrees F. and a white blood cell count of only 1,300 with 42 per cent polymorphonuclear leucocytes. He died on March 2 at 2 a.m., 4 days after admission. A generalized peritonitis due to perforation of an ulcer at the pylorus was found at autopsy.

TABLE III.—MORTALITY AND MORBIDITY IN OPERATIVE CASES

Author	*Years*	*No. Cases*	*No. Deaths*	*Mortality Per cent*	*Complications*
Luer (15)	1938–1948	318	58	18.2	84 Wound complications 141 Other
O'Donoghue et al. (18)	1948–1950	200	13	6.5	Not stated
Cohn and Mathewson (6)	1942–1947	240	17	7.1	Not stated
Kingsbury and Peacock (13)	1944–1949	169	16	9.5	17 Wound complications 51 Other
Beahrs et al. (2)	1941–1951	114	3	2.6	16 Wound complications 28 Other
Heslop et al. (12)	1946–1950	104	9	8.6	3 Wound complications 14 Other
Schmitz, Harkins et al. (22)	1948–1952	103	6	5.8	5 Wound complications 12 Other
Mage and Payson (16)	1946–1950	97	7	7.2	11 Wound complications 10 Other
Baritell (1)	1947	88	1	1.1	10 Wound complications 11 Other
Vaughan and Warren (28)	1944–1949	70	1	1.4	Not stated
Lassen (14)	1947–1951	60	4	6.7	Not stated
Glenn and Harrison (11)	1944–1950	59	6	10.2	14 (Not classified)
Totals		1622	141	8.7	

Case 3. A white man, 39 years of age, presented himself at a dispensary at 9 p.m. on July 20, 1949. He was drunk and complained of epigastric pain. Perforation of a peptic ulcer was not suspected. At 3:40 p.m. on July 21, he was referred to the hospital in a moribund condition. There was a generalized boardlike rigidity of the abdominal wall, an absence of blood pressure, and a pulse rate of 160. Air was present beneath both leaves of the diaphragm. In spite of 1,000 cubic centimeters of blood by transfusion, the systolic pressure was never recorded above 60, nor the pulse rate below 140 per minute. The patient died 23 hours after admission. At autopsy a large perforation of a gastric ulcer was found on the anterior surface of the stomach midway between the greater and lesser curvatures. A most severe generalized peritonitis was present, which was thought to have been produced not only by the gastric juices but also the 10 cubic centimeters of paraldehyde which had been administered by mouth when the patient was first seen in the dispensary.

Case 4. A 40 year old white man was admitted to the hospital at 11:45 a.m. on October 14, 1950. Nine hours and 15 minutes before admission he had experienced a sharp, excruciating abdominal pain. He was in profound circulatory collapse with a blood pressure of 80 systolic and 60 diastolic. His skin was cold and clammy and his abdomen boardlike. His temperature was 99.8 degrees F. Roentgenologic examination of the abdomen revealed free air in the peritoneal cavity. The serum amylase level was normal. The white blood cell count was 7,300 per cubic millimeter with 50 per cent polymorphonuclear leucocytes. In spite of multiple transfusions, intravenous fluids, generous antibiotics, and continuous gastric decompression, his pulse remained weak and thready and the systolic blood pressure could not be raised over 90 millimeters of mercury. At the time of admission 60 cubic centimeters of urine were obtained by catheter; thereafter no urine was excreted. During the first 2 days he was lucid, then became irrational, and in the final hours he was comatose. The blood urea nitrogen on October 16 was 114 and on October 19, 150. At no time during hospitalization was he considered in condition for operative intervention. Autopsy revealed a generalized peritonitis, three duodenal ulcers (one of which had perforated through the posterior duodenal wall) bronchopneumonia, and lower nephron nephrosis.

Case 5. Perforation of a duodenal ulcer occurred in a patient who was being treated for myocardial infarction and cardiac failure. The cardiac condition precluded laparotomy and at the time of death from heart failure, a few days after the institution of nonoperative treatment, an autopsy revealed the duodenal perforation to be well encased in a fibrous ring adherent to the under surface of the liver. Undoubtedly, this patient would have survived the perforated ulcer had the cardiac condition permitted.

Case 6. A 67 year old white man was transferred from a nearby dispensary complaining of severe epigastric pain which had begun suddenly 3 hours earlier. Subsequently, he had vomited small amounts of material resembling coffee

grounds, without relief of pain. His past history revealed that he had been receiving outpatient care for hypertensive cardiovascular disease, chronic laryngitis, and peptic ulcer for some years. On admission, he was extremely ill and in severe pain. His hands and feet were cyanotic and, because of laryngeal obstruction, respiration was difficult. Pulsus paradoxus was noted and the venous pressure was 190 millimeters of water. The blood pressure was 160/90, the pulse rate 96, and the temperature 98 degrees. The leucocyte count was 6,600, with 71 per cent polymorphonuclear cells. Pneumoperitoneum was present. There was marked rigidity of the abdomen and peristalsis was absent. He was given oxygen, sedation, intravenous fluids, antibiotics, and blood; gastric suction was established. In 24 hours there was considerable improvement, and in 48 hours the abdomen was soft and peristalsis was normal. However, oliguria developed and there was progressive respiratory embarrassment. An emergency tracheotomy was performed on the second day after admission and, as a tracheal ring was being incised, cardiac action ceased. The intracardiac administration of adrenalin and other measures were successful in restoring normal cardiac and respiratory activity within 5 minutes, but decerebrate rigidity developed within the next 24 hours and the patient died on the third day. Autopsy revealed marked generalized arteriosclerosis, pericarditis, early bronchopneumonia, and a tracheobronchial tree obstructed with inspissated mucus. There were two duodenal ulcers, one of which had perforated anteriorly but was sealed by the omentum, the gallbladder, and the under surface of the liver. There was minimal peritoneal injection and the peritoneal fluid was sterile. It is believed that this patient would have survived the perforated ulcer had the unrelated respiratory and cardiac problems permitted.

Case 7. This 65 year old white man had a long history of duodenal ulcer, including a perforation which had been treated successfully by nonoperation 2 years earlier. Forty-eight hours after his second perforation, on July 8, 1953, he was hospitalized in a serious condition. An examination revealed an elderly confused man in severe distress and showing advanced signs of arteriosclerosis and emphysema. The abdomen was boardlike and tender, the pulse rate was 104, the temperature 97 degrees, and the blood pressure 110/80. The white blood cell count was 8,000 with 75 per cent neutrophils. The blood urea nitrogen was 98, and urinalysis revealed albumin and casts. An hypochloremic alkalosis was present. Considerable free air was present in the peritoneum. Measures were taken to correct the fluid and electrolyte imbalance, gastric decompression was instituted, and antibiotics were administered. It was noted early that large volumes of fluid and air were continually aspirated through the Levin tube. However, the condition seemed to be improving and, as the abdomen became soft and peristalsis returned, gastric suction was interrupted on the fifth day. Shortly thereafter, pain and tenderness returned to the epigastrium and x-rays revealed re-accumulation of air beneath the right diaphragm. Suction was re-established and more than 700 cubic centimeters of sterile fluid were aspirated from the right upper quadrant. Since there was no indication of a tendency toward spontaneous closure, an operation was performed on the sixth hospital day. A large anterior defect in the duodenum was found opening into a walled-off cavity in the right upper quadrant. The ulcer was closed and the cavity drained. Improvement was again noted for the next 4 days, but, upon being transferred from an air-conditioned recovery room to an open ward, the patient suddenly went into shock from which he slowly responded. From then on his condition generally deteriorated, with rising blood urea nitrogen, respiratory difficulty from his emphysema, and the development of a duodenal fistula with its attendant electrolyte problems. Death occurred on the twelfth postoperative day, the eighteenth day after admission. Autopsy was not permitted.

Complications. Excluding the 7 deaths, there were 27 complications in 24 patients, a rate of 18 per cent. Tabulation of the complications appears below:

Subphrenic abscess	7
Upper abdominal abscess	2
Pelvic abscess	3
Lower abdominal abscess	2
Pleural effusion	4
Pneumonitis	4
Drug psychosis	2
Penicillin reaction	1
Thrombophlebitis	1
Pyloric stenosis	1
Total complications (in 24 patients)	27

Of the 7 subphrenic abscesses, 4 required drainage. Two of these proved to be sterile on culture of the fluid removed. The remaining ab-

scesses were of small size and resolved spontaneously. One upper abdominal and two pelvic abscesses required drainage. One patient developed a 50 per cent obstruction at the pylorus which required elective surgery 5 weeks after perforation. At operation the perforation was found to be well sealed and in healing had caused the constriction. Temporary psychosis caused by antibiotics was encountered in 2 patients, while a minor penicillin reaction developed in one patient. A few of the complications in this series were those which would be minimized by early ambulation, but since continuous gastric suction and intravenous therapy are employed in the nonoperative treatment, this is precluded in the early days of treatment.

These figures compare favorably with those of many operative series when complications secondary to the wound are excluded (Table III). When such operative complications as wound infection, evisceration, and fistula are included in the comparison, our rate would appear to be lower than that of many in the operative collection.

METHOD OF TREATMENT

Immediately upon admission of a patient suspected to be suffering from perforation of a peptic ulcer, a Levin tube was passed into the stomach and the contents were aspirated. Patients were placed on their left sides while being wheeled to the radiology department, and a left lateral decubitus exposure was taken before they were permitted to assume an upright position for the next roentgenogram. Recently, when the patient's condition permitted, an additional lateral exposure has been made with the patient in the supine position. This maneuver occasionally revealed gas beneath the anterior abdominal wall which was not detectable in the other views.

On admission to the ward, continuous gastric decompression was begun, ¼ grain of morphine sulfate was administered, and laboratory procedures were initiated. These included determinations of the complete blood count, hematocrit, total protein and albumin/globulin ratio, blood chloride level, and, in recent years, a determination of the serum sodium and potassium. In the majority of cases, serum amylase studies were carried out but they failed to demonstrate a significant elevation. Electrocardiographic tracings, roentgenograms of the chest, and other procedures were carried out as indicated. In most cases morphine was repeated after 4 hours, but rarely were more than three doses required. Supervised bed exercises were instituted as soon as practicable and, when indicated, the patient's legs were wrapped with elastic bandages in an effort to prevent venous thrombosis during the early days of treatment when ambulation was precluded.

Gastric decompression of the stomach is considered the most important single feature of the treatment, and continual attention by trained personnel is necessary for its success. No fluids were permitted by mouth except those concerned with oral hygiene. Occasionally, when large food particles occluded the smaller lumen of the ordinary Levin tube, temporary replacement by a larger stomach tube became necessary. A reliable indication that the stomach is well emptied (usually apparent within the first 12 hours of treatment) is the presence of bile in the aspirated fluid. Testing the patency of the Levin tube by gentle instillation of normal saline solution and its withdrawal was carried out at frequent intervals both day and night.

Intravenous therapy. During the first 24 hours of therapy, 3,000 cubic centimeters of intravenous fluid were usually necessary. This included at least 1,000 cubic centimeters of 5 per cent glucose in normal saline solution. The remaining fluids and electrolytes were adjusted in accordance with the blood chemistry determinations, the state of hydration, and the urinary determinations. In most cases, thiamine chloride, nicotinamide, riboflavin, vitamin K, and ascorbic acid were added to the intravenous solutions and, when hypoproteinemia or anemia existed, whole blood transfusions were employed.

Antibiotics and chemotherapeutic agents. During the first 2 years of this study, the majority of patients received an average of 100,000 units of penicillin every 4 hours by the intramuscular route. Two grams of sodium sulfadiazine were given intravenously on admission, followed by 1 gram every four hours. During the past five years, based on the experience of Pulaski, Voorhees and Seeley (19) in the treatment of peritonitis, the amounts and types of antibiotics were gradually increased until a standardized solution for intravenous use was developed.

This preparation consists of 1,000,000 units of penicillin, 1 gram of streptomycin, and 2.5 grams of sodium sulfadiazine in 1,000 cubic centimeters of normal saline solution, or 5 per

cent glucose in water. This is given over a 12 hour period by slow intravenous drip and repeated every 12 hours until about the fifth day when the recovery of the patient may permit removal of the Levin tube and reduction in the amount of drugs used.

Clinical course. After administration of the first dose of morphine and satisfactory emptying of the stomach, most patients were quite comfortable, even though abdominal rigidity was present. As a rule, rigidity of the lower abdomen was absent within 12 hours, regression being from below upward, and no rigidity was present after 36 to 48 hours. Deep tenderness usually persisted in the epigastrium up to the sixth day. Peristalsis might be elicited on the second or third day. On the fifth or sixth day a mixture of equal parts of milk and cream was given in 30 cubic centimeter portions by mouth each hour with the nasogastric tube in place but with suction discontinued. If no evidence of peritoneal irritation occurred during 24 hours of this regimen, the tube was withdrawn, and the diet was gradually increased in much the same manner as the graduated feedings which are employed following a gastroenterostomy. Ambulation was permitted following removal of the Levin tube.

Patients were observed for 10 to 14 days, and studies were made to rule out such complications as pleural effusion and subdiaphragmatic abscess. A rectal examination was performed periodically to rule out pelvic abscess. Streptomycin and sulfadiazine were usually discontinued on the fifth day, but penicillin was given intramuscularly until about the tenth day. The temperature was then carefully checked to insure an afebrile course. By the fourteenth day, in the absence of complications, the majority of the patients were asymptomatic and would normally have been discharged to their homes. However, before the return of military patients to full duty, they were transferred to the medical service where x-ray examinations of the gastrointestinal tract were ordered and, if the symptoms persisted, a dietary regimen was followed in an attempt to cure the ulcer.

Follow-up studies. No attempt was made to follow up these patients beyond the immediate period of ulcer sealing and its possible complications, or to determine what percentage of them had recurrence of ulcer symptoms. However, it is interesting to note that in 14 patients subsequently operated upon for cure of chronic ulcer there were minimal peritoneal adhesions, and in no patient was fluid or foreign material encountered in the peritoneal cavity. The number of adhesions found was no greater—perhaps smaller in many cases—than the number in patients with histories of surgical closure of a perforated ulcer, cholecystectomy, or similar operative procedure.

DISCUSSION

Comparison of operative and nonoperative methods. An ideal comparison between two methods of treatment should include all cases admitted to the hospital during the period of study, whether such cases are diagnosed correctly, clinically, or not determined until autopsy. Very few reports concerning treatment of perforated peptic ulcer include cases diagnosed only at autopsy, and many of the operative series which we have examined exclude from their results those patients who, for one reason or another, were not operated upon. Therefore, in order to determine the more successful form of therapy, the results in patients operated upon must be compared with the results obtained in patients treated nonoperatively but who could have been operated upon. An attempt to make such a comparison between two collected series of cases treated over approximately the same period of time has been made in Tables III and IV.

Surgically treated cases carried a mortality of 23.4 per cent for 15,340 cases, according to the collected series of DeBakey (8) for the period from 1930 to 1940. Better methods of treatment have reduced this figure considerably, as shown in Table III, in which the average mortality in 1,622 cases recently reported in 12 operative series was 8.7 per cent. In spite of this improvement, Glenn and Harrison (11) are still disturbed because there has been very little decrease in the mortality in their cases, while the morbidity (excluding pulmonary complication) was almost identical in their earlier and later series.

We have surveyed the available literature since the advent of chemotherapeutic agents and have tabulated in Table IV the results of therapy in 857 patients treated by the nonoperative method. This total includes 73 patients whose general condition, as indicated by the author in each report, would not permit operation. The over-all mortality in this collected series was 11.4 per cent and compares favorably with the mortality of 8.7 per cent in the combined operative

TABLE IV.—MORTALITY AND MORBIDITY IN NONOPERATIVE CASES

Author	*Years*	*No. Cases*	*No. Deaths*	*Mortality Percent*	*Operable cases*	*Operable deaths*	*Corrected mortality Percent*	*Complications*
H. Taylor (27) (collected)*..	1945–1951	476	40	8.4	449	21	4.7	Not stated
Seeley and Campbell (selected)**....	1945–1953	139	7	5.0	134	2	1.5	27 (See text)
Heslop et al. (12) (consecutive).....	1947–1951	104	8	7.7	100	4	4.0	3 Subphrenic abscesses
Schmitz, Harkins et al. (22) (selected).....	1948–1952	31	24	77.4	13	6	46.2	Not stated
Cohn and Mathewson (6) .. (selected)	1942–1947	25	15	60.0	8	0	0	2 Subphrenic abscesses 1 Subhepatic abscess
F. Taylor and Egbert (26) (selected).....	1937–1952	24	2	8.3	24	2	8.3	Not stated
Scott (23) (consecutive).....	1951	15	0	0	15	0	0	1 Subphrenic abscess
Bertram (3) (consecutive).....	1945–1950	13	0	0	13	0	0	1 Subphrenic abscess
Vaughan and Warren (28) (selected).....	1944–1949	11	2	18.2	9	0	0	4 Intraperitoneal abscesses 1 Hematemesis
Birks (5) (selected).....	1944–1947	9	0	0	9	0	0	None
Bingham (4) (selected).....	1948	5	0	0	5	0	0	None
Baritell (1) (selected).....	1947	5	0	0	5	0	0	1 Subphrenic abscess
Totals.....		857	98	11.4	784	35	4.5	

*Includes Taylor's consecutive series of 101 cases.
**Includes 115 consecutive cases.

series. When inoperable cases are excluded, the mortality in the nonoperative group falls to 4.5 per cent, which is slightly more than half that of the operative collection.

A detailed comparison of the causes of death in the two collections was not possible because of incompleteness of the data. However, it would appear from available evidence that about half of the deaths in both series were due to unrelated conditions, such as coronary occlusion, cardiac arrest, cerebrovascular accident, pulmonary embolism, and delirium tremens, while the remaining deaths were directly related to the perforated ulcer or its treatment. In the conservative series these remaining deaths were mainly due to peritonitis and its sequelae or to the failure of the ulcer to close. They appeared to be counterbalanced by an equal proportion of deaths in the operative series due to peritonitis and its sequelae, postoperative shock, intestinal obstruction or atelectasis, and duodenal fistula secondary to leakage at the suture line. Thus, it would be difficult from these considerations alone to indict either type of treatment, as the percentage of deaths which might have been prevented by operation in the conservative series finds a similar percentage of deaths in the operative series which might not have occurred had surgical interference been withheld. It is in cases of this type that stubborn insistence on one type of treatment must give way to unbiased judgment in an effort to choose the correct treatment for the individual patient.

Reports of complications in the series examined were either omitted or so variably reported that it was difficult to make an accurate comparison between the two methods of treatment. However, from the information available, it would appear that the total complications in the operative collection were considerably higher than those in the conservatively treated group. This difference was still apparent when such surgical complications as wound hematoma, wound infection, evisceration, and duodenal fistula (conditions obviously avoided when the nonoperative approach is chosen) are excluded from the comparison. Pulmonary complications secondary to operation and anesthesia undoubtedly contributed to the higher rate in the operative cases.

Comparison by other authors. Included in Tables III and IV are four individual comparative studies of the operative and nonoperative methods. These are reported by Heslop, Bullough, and Brun (12), Schmitz, Harkins, Olson, Moore, and Merendino (22), Cohn and Mathewson (6), and Vaughan and Warren (28). In the last three reports, cases for nonoperative treatment were

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selected for various reasons. When inoperable cases (as indicated by the authors) are excluded from the conservatively treated cases in the four studies, only in the report of Schmitz *et al.* was the mortality of the nonoperative cases found to exceed that of the operative cases. The patients in the latter series were of a relatively advanced age and a large proportion of them were alcoholics in varying states of malnutrition. It was noted that 35 per cent of them were drunk on admission. Perhaps the difficulties of maintaining continuous gastric suction and administration of intravenous fluids in such uncontrollable patients creates a serious objection to nonoperative treatment. Our experience includes a few successfully treated cases of this type, but other observers also caution against conservative treatment in the unco-operative patient.

The comparative study reported by Heslop *et al.* deserves close attention as it presents an excellent critical approach to the problem. These authors set out to compare the methods by blindly carrying out two consecutive and unselected series in which all patients admitted to one hospital were operated upon and all admitted to another institution were treated conservatively. There were 104 patients operated on with a mortality of 8.6 per cent, while for 104 nonoperative cases the mortality was 7.7 per cent. With so little difference in the figures, the reporters conclude that the nonoperative method, if administered under proper supervisory conditions, might just as well be the routine treatment with a careful selection of patients requiring operation, or, alternatively, that the routine treatment should be operative, with a careful selection of patients who might do better if treated conservatively. Among the 8 deaths in their nonoperative series, 4 patients who were quite unfit for any form of operation were included. If these had been excluded, the nonoperative treatment would appear to have an advantage. It may also be noted that the complications were considerably less in the nonoperative group.

Opinions of others. Herman Taylor (27), who has been a persuasive proponent of the nonoperative method for many years, concludes that the first step in the treatment of any perforated ulcer under any circumstances is prompt evacuation of the stomach, and that in the further treatment of most perforations continued aspiration is the method of choice. He also advised that operation be reserved for special conditions such as air swallowing or for patients who cannot be intubated or who are uncontrollable. Scott (23) suggests that immediate operation in simple gastroduodenal perforation is no longer necessary and that any operative intervention should be reserved for such complications as may arise. Vaughan and Warren (28), F. W. Taylor and Egbert (26), Mage and Payson (16), Cohn and Mathewson (6), and many others believe that nonoperative treatment should be employed only in those delayed cases in which there is definitive evidence of spontaneous containment of the effects of perforation, or in which the condition of the patient precludes laparotomy. Stead (25), while considering the nonoperative method as still being on trial, admits that this treatment is practicable but that it demands constant supervision by an experienced surgeon, especially during the first 6 hours, after which he feels that it is usually possible to determine whether the method is succeeding.

Rea (20) states that the conservative method is no longer experimental and has instilled small amounts of diodrast into the stomach in an attempt to determine which perforations have sealed spontaneously. Zinninger (30) feels that in patients seen more than 24 hours after perforation, operation to close the perforation is rarely indicated, since by that time sealing off has occurred or diffuse peritonitis is present. Dodson (9) followed this principle successfully in the treatment of 6 patients whom he then subjected to gastrectomy within 26 days after the perforation.

Criticisms of the nonoperative method. Collins (7) and an editorial in *The Lancet* (10) have summarized the essential criticisms of the nonoperative method. These include the following:

1. Aspiration will not be successful in patients who perforate with a stomach filled with food or liquid.

2. It is difficult to guess which lesions will seal spontaneously; large lesions, especially gastric perforations, will rarely seal by themselves.

3. There is danger of passing the aspiration tube through the perforation.

4. There is often insufficient evidence of the diagnosis in successful cases, and the condition may actually have been that of a penetrating ulcer or some other imitator of perforation.

5. There is danger of missed diagnosis in cases of acute perforative appendicitis, chole-

cystitis, diverticulitis, and in cases of devitalized bowel.

6. Perforations due to malignancies cannot be distinguished.

7. The necessary period of bed rest increases the chances of fatal complications.

Certainly, a method of treatment which permits a high percentage of mistaken diagnoses is not to be recommended. In our opinion, we have submitted sufficient evidence for the diagnosis in each case in this series and have included no cases of penetration, cholecystitis, or other conditions which might favorably affect our figures. In regard to more serious errors of diagnosis, it is thought that under the careful observation of a qualified surgeon such conditions will manifest themselves in sufficient time to permit successful surgery. In our series there were no cases of this type. On the contrary, 5 patients suffering from serious medical conditions were spared a needless and perhaps harmful operation because of our nonoperative policy. Thus the question of clinical error is a two-edged sword. While the nonoperative treatment might delay necessary surgery in an occasional case, it will salvage some of those patients who would otherwise have lost their lives because operation was performed under the mistaken diagnosis of perforation when the true condition was coronary occlusion, dissecting aneurysm, pneumonia, or pancreatitis.

Those rare perforations which fail to seal under nonoperative treatment should be detectable by careful and repeated observations. Operation may then be performed with the patient often in better condition than he was upon admission. Only 1 of our 139 patients required operative closure, and this patient died of a duodenal fistula on the twelfth postoperative day. It is not believed by the authors that this elderly man, who had perforated 48 hours prior to admission, would have had a better chance with early surgery.

Fullness of the stomach at the time of perforation did not appear to affect the mortality or morbidity in this series and there were no known cases in which the aspiration tube passed through the site of perforation. Perforation of gastric carcinoma can occur, although it is rare, since considerable inflammatory reaction limits the area involved. Our 3 operable cases of gastric perforation were successfully treated without operation. Follow-up studies revealed evidence of malignancy in 1 case, but at operation the perforation was found to be firmly sealed. No fatal, and only a few nonfatal complications in our operable series could be attributed to the short period of bed rest necessary in the early days of nonoperative treatment.

In contrast to the somewhat theoretical disadvantages discussed above, the nonoperative method offers certain concrete advantages. The most obvious of these is the lower mortality and morbidity. Operative risk and complications, especially in misdiagnosed cases in which operation is contraindicated, are avoided and the patient usually experiences a shorter and more comfortable convalescence.

Importance of gastric decompression. The single most important element in the nonoperative treatment is continuous and complete gastric decompression. As expressed in *The Lancet* (10), ". . . like the diver on the bottom of the sea, the patient's life depends utterly on an uninterrupted flow through a long flexible tube." Carelessness on the part of anyone concerned with this aspect of the treatment may encourage complications or even a fatal outcome.

Any clinician who deliberately elects to employ a conservative type of management in perforated peptic ulcer must be willing to spend considerable time in supervising the details of this method and in carefully observing the course of his patient. There is no denying that immediate operation with closure of the perforation is less strenuous for, and of greater soporific value to, the surgeon, but a comparison of the results of treatment would indicate that the additional effort needed for success with the nonoperative method of treatment has been well rewarded.

SUMMARY

1. A series of 139 cases of perforated peptic ulcer treated by the nonoperative method has been presented. The mortality in the 134 cases suitable for operation was 1.5 per cent.

2. All available reports of perforations treated by the nonoperative method have been compared with a large number treated by surgical closure of the ulcer since chemotherapy and antibiotics have been available. Among the 1,622 patients operated upon there was a mortality of 8.7 per cent; in the nonoperative series of 784 operable cases the mortality was 4.5 per cent.

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3. Complications due to surgery were obviously absent in the conservatively treated cases, while the number of other complications appeared to be lower in the nonoperative group.

4. Nonoperative management of perforated peptic ulcer offers several other advantages not apparent in the operative approach. It must be stressed, however, that the method demands close surveillance by one surgically qualified to cope with any acute intra-abdominal disease.

ADDENDUM

Since the submission of this article for publication, 19 additional cases of perforated peptic ulcer have been successfully treated by this method.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

The Impact of Boxing upon the Visual Apparatus. JAMES HAMILTON DOGGART. *Arch. Ophth.*, Chic., 1955, 54: 161.

IN THE INTRODUCTION of this subject, the author presents some interesting considerations on the appeal of boxing to man, as well as some historical boxing episodes.

Changes from boxing may involve the eyes, adnexa, and/or visual pathways and related brain structures. External ocular damage includes conjunctival hemorrhages, corneal injury, and scleral ruptures. Inner eye damage includes hyphema, rupture of the pupil margin, iridodialysis, hypotony due to damage of the ciliary processes, paralysis of accommodation, lens displacement, cataracts, vitreous hemorrhage, retinitis proliferans, and retinal detachment. Macular changes, retinal and choroidal hemorrhages, optic atrophy, and recurrent congestive glaucoma also have been reported. Damage to the adnexa include thickening of the orbital margin, hyperostoses, fractured bones of the orbit, ethmoid, lacrimal, maxillary, and malar bones, orbital emphysema due to fractured nasal sinus, nasolacrimal obstruction, lacrimal gland damage, and ptosis from levator muscle damage. Extraocular muscles, especially superior and inferior obliques, because of their proximity to orbital margin, suffer lacerations, hemorrhages, fibrous tissue formation; exophoria, due to ambylopia and diplopia, can result. Visual path and brain damage show effects of traumatic encephalopathy and include hemorrhage and reactive fibrosis due even to light blows. Personality changes, amnesia, slurred speech, poor memory, and paranoia may occur.

The article is concluded with a plea to end this barbaric sport. —*Albert C. Frell, M.D.*

Recession Lengthening of Medial Recti for Convergent Squint; A Preliminary Report. K. DEAN FOGGITT. *Brit. J. Ophth.*, 1955, 39: 488.

THE AUTHOR describes a new technique for lengthening and weakening the internal rectus, and he designates this procedure as recession-lengthening. The technique comprises a 4 mm. recession, combined with two partial myotomies—one 7 mm. behind the tendinous insertion and the other 7 mm. behind the first one. Two-thirds of the muscle is sectioned, and section is preceded by a crushing of the muscle with a hemostat, to prevent bleeding from the muscle.

After 4 years of experience with this procedure, the author advocates it chiefly for cases of hypertrophy and fibrosis of the internal recti. The chief clinical indication is that of convergent squint with a decidedly variable angle, a small minimum angle, and a maximum angle at least 20 degrees greater than the minimum. Surgery on the lateral rectus should not be done at the same sitting, and, if indicated, should be performed as a secondary procedure.

The chief advantage of this procedure has been the absence of overcorrection during the 4-year period. It is too early to evaluate the final results.

—*Ray Karchmer Daily, M.D.*

EAR

The Mobilization of Middle-Ear Structures Through the Eustachian Tube. SYLVESTER DALY, LOUIS J. GOLDSTEIN, MORRIS HELLER, BERNARD ANDERMAN, and MARGARET MOLLE EZEKIEL. *Arch. Otolar.*, Chic., 1955, 62: 187.

IT IS OBSERVED that while per eustachian tube methods for the treatment of pathologic middle ear conditions once enjoyed considerable favor, they have had little recent use. The Miot-Rosen technique for the treatment of otosclerosis led the authors to consider the possibility of mobilizing the middle ear structures via the eustachian tube, and their experiences with this procedure in a number of cases of active and healed suppurative otitis media and of otosclerosis are given. Each patient was given an hypnotic and the eustachian orifice was then anesthetized locally. Under nasopharyngoscopic vision a eustachian catheter was applied to the orifice and a decongestant spray insufflated into the tube. A bougie was then passed through the catheter and eustachian tube into the middle ear where its tip (or the movements associated with the presence of its tip) could be observed. The bougie was then manipulated, the movements within the middle ear being presumed to resemble "massage to a stiffened joint." Five cases, including one of otosclerosis, are presented in some detail; 4 of the 5 patients gained considerable improvement in hearing (audiograms shown), while the fifth one (a case of otosclerosis) gained only slightly and is included to show that even otosclerosis may benefit to a slight extent from this treatment. The authors do not mention the number of patients treated in this way nor do they indicate their success rate; they did not, however, have any cases of secondary middle ear infection or hemorrhage.

—*John R. Lindsay, M.D.*

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Stapes Mobilization in Otosclerosis; the Primary Results and a Review of 63 Cases. YRJÖ MEURMAN and OTTO MEURMAN. *Arch. Otolar.*, Chic., 1955, 62: 164.

THE AUTHORS review the development of the operation for stapes mobilization and the pathology of otosclerosis, emphasizing that the round window is very rarely involved to the extent that diminished hearing results; that the entire circumference of the stapes footplate is not usually involved; and that the stapedial crurae may be weakened by otosclerotic foci.

The authors' experience with the operation in 63 cases is described. Their cases were classified into three groups according to the magnitude of air and bone conduction losses: 37 (58.7%) cases gained some improvement in hearing, while the remainder were unchanged; of the 40 cases in the best group, in which air and bone conduction losses were relatively small, 24 (60%) showed some improvement, 19 of the 40 (47.5%) enjoying "good" postmobilization hearing. The magnitude of the improvement in hearing is examined in greater detail in some of the 63 cases, but the absence of some of the cases from the detailed analysis minimizes the value of these figures. No case has regressed after reaching the maximum postoperation hearing level during the relatively short time that has elapsed since operation. In some cases the stapes was readily mobilized; in others it was mobilized only with difficulty; the degree of fixation encountered appeared, moreover, to bear no relation to the duration of the deafness. The authors were able, in some of their cases, to see movements of the round window membrane (or of fluid lying upon it) as the mobilized stapes was rocked.

Complications encountered included luxation of the incudostapedial joint, rupture of the pars tensa, and transient facial nerve palsy.

The authors claim that the mobilization operation is a worth-while procedure because, when it succeeds, the hearing improvement may exceed that to be expected from a fenestration, because mobilization is a relatively minor procedure requiring little after treatment, and because, in case of failure, fenestration is still possible. —*John R. Lindsay, M.D.*

The Treatment of Purulent Otogenic Meningitis. SHIRO NAKAMURA, DENZO TOYOMURA, and NOBUOSA IIDA. *Arch. Otolar.*, Chic., 1955, 62: 42.

THE AUTHORS emphasize the importance of a thorough surgical removal of the primary foci in cases of purulent otogenic meningitis, and then recount their experience with the use of parenteral penicillin in these cases and in experimental animals (rabbits). The penicillin was administered intra-arterially (carotid or vertebral arteries), intravenously, intramuscularly, intracisternally, or intraspinally, and the penicillin levels of blood and cerebral spinal fluid were determined at various times after administration. Of the extrathecal routes, intracarotid arterial administration gave the best results in terms of the rise and maintenance of cerebral spinal fluid penicillin levels. The intramuscular route was strikingly inefficient in this respect. The optimum intracarotid dose of penicillin appears to be between 600 and 1,000 units/kgm., a dose which must be repeated two or three times a day. Intracisternal administration is more efficient than intraspinal, the optimal dose via the former route being 200 to 300 units/kgm. —*John R. Lindsay, M.D.*

NOSE AND SINUSES

The Ligation of Both External Carotid Arteries for the Control of Epistaxis. ARTHUR J. KUHN and O. ERIK HALLBERG. *Arch. Otolar.*, Chic., 1955, 62: 130.

FOUR practical sites for arterial ligation in severe epistaxis are: the septal branch of the superior labial artery, in the anterior nasal floor, the anterior ethmoidal artery, along the medial wall of the orbit, the external carotid artery, in the neck and usually between the lingual and superior thyroid branches, and the internal maxillary artery, in the pterygomaxillary fossa. Ligation of the internal carotid or the common carotid artery, or both, for epistaxis is mentioned only to be condemned.

Multiple ligations are occasionally necessary, usually involving the external carotid and anterior ethmoidal arteries of the same side; however, ligation of both external carotid arteries for epistaxis is apparently unusual. In two cases of severe epistaxis that required ligation of both external carotids for control, no sequelae of arterial insufficiency developed. The collateral arterial supply to the nose is reviewed, and it is pointed out that the extensive nature of the collateral supply accounts for the absence of sequelae after ligation and for the occasional failure of arterial ligation to control epistaxis.

NECK

Cancer of the Thyroid in Children. ROBERTSON WARD. *Am. J. Surg.*, 1955, 90: 338.

AT THE University of California Hospital, in San Francisco, malignancy was found in 32 per cent of nodular goiters removed from birth through 21 years. The prognosis depended on the pathologic picture, the possibility of complete extirpation, the presence of metastases, the affinity of the tumor for radioactive iodine, and the sensitivity of the tumor to external radiation.

If the tumor is of a papillary pattern or if it is sensitive to external radiation, long survival may occur even if there are lateral cervical metastases. Prolonged survival and reasonably good health are not incompatible with pulmonary metastases although distant metastases force a grave eventual prognosis.

Three cases with long follow-up are presented. A 9-year-old boy was treated by x-ray for hyperthyroidism. The following year hemithyroidectomy and cervical node dissection were done. The sections showed adenocarcinoma. At the age of 18, the cervical nodes began to enlarge. They responded to x-ray therapy. A small therapeutic dose of I^{-131} was given at the age of 25 after favorable uptake of the tracer. Two years later, larger doses of I^{-131} were given with satisfactory resolution of the cervical and pharyngeal wall tumor. Also, there was disappearance of pulmonary metastases which had been evident roentgenologically for 17 years. Subsequently, cervical metastases recurred and biopsy showed that the tumor had become anaplastic. Death occurred at 30 years of age and autopsy showed carcinomatosis. The length of survival

was 20 years from the time of diagnosis. During most of this time the general health of the patient was good enough for a normal existence.

A 16-year-old girl with adenocarcinoma of the thyroid and lateral cervical metastases was treated by right partial lobectomy, left total lobectomy, and left radical neck dissection, followed by x-ray therapy. Twenty-five years later she is well and without evidence of recurrence.

Another girl was first noted to have a mass in the thyroid and enlarged cervical lymph nodes at the age of 3 years. A year and a half later biopsy of one of the nodes showed papillary adenocarcinoma. She was given x-ray therapy and tolerance doses of thyroid substance with satisfactory disappearance of the tumors. When she discontinued taking thyroid substance at the age of 14, the tumors began to grow. There was no uptake of I^{131}. Total thyroidectomy and bilateral neck dissection was done. Microscopic examination showed papillary adenocarcinoma with invasion of the capsule, blood vessels, and lymph nodes. She resumed taking thyroid substance and a residual nodule was removed from beneath the mastoid process 6 years later. The microscopic picture was unchanged. At 22 years of age, 18 years after the original diagnosis, she is well and without evidence of recurrence. The prognosis is considered good as long as the tumor remains of the papillary type and the patient continues to take thyroid substance. —*Robert W. Williams, M.D.*

Laryngeal Carcinoma in Connecticut; Observations with Particular Reference to Its Surgical Treatment. TIMOTHY L. CURRAN. *Arch. Otolar.*, Chic., 1955, 62: 145.

A SHORT historical review of the treatment of laryngeal carcinoma is presented. Tracheotomy was performed for carcinoma of the larynx as early as the first century B.C. Gurdon Buck, in 1851, performed the first laryngofissure in America for carcinoma of the larynx; Billroth, in 1873, performed the first laryngectomy; Verdi, in 1921, performed the first reported laryngectomy in Connecticut.

Because of the greater life expectancy today, the incidence of laryngeal carcinoma is increasing. From 1921 to 1940 there were 94 cases of laryngeal carcinoma admitted to the New Haven Hospital, while from 1941 to 1950 there were 136 cases.

The Cancer Research Division of the Department of Health in Connecticut accumulated 93 cases of laryngeal carcinoma from 1935 to 1939; 152 cases from 1940 to 1944; and 282 cases from 1945 to 1949. That is a total of 527 cases in 15 years. Of these, 486 were males and 41 were females. Of 284 patients treated between 1935 and 1945, 73 (25.7%) are alive and free from cancer 5 years after diagnosis. Of the 73 patients, 14 had limited surgery for cure, 3 had limited surgery for cure, and irradiation, 23 had radical surgery, 4 had radical surgery and irradiation, 2 had limited surgery for palliation and radiation, 6 had biopsy removal, and 19 had irradiation alone; in 2 cases the type of treatment is unknown. Limited surgery refers to partial laryngectomy (laryngofissure). Radical surgery refers to total laryngectomy and radical neck dissection.

Direct laryngoscopic examination may remove a malignant growth by biopsy when it is very early and on the free edge of the cord. The author cautions that such a patient requires extremely careful follow-up even when negative biopsy reports are obtained subsequently.

In Connecticut, at least 21 laryngologists and 5 general surgeons are performing laryngeal surgery.

Follow-up reports, for statistical purposes, must be complete and accurate.

Speech training of the laryngectomized patient can be obtained in Connecticut through the State Veterans Hospital, the Department of Rehabilitation, and through the Connecticut Cancer Society.

The author includes 17 cases of laryngeal carcinoma in patients he has treated surgically in the past 6 years. Laryngectomy was performed in 12 of these patients, 6 of whom are alive and well; 5 patients had partial laryngectomies and, of these, 4 are alive and well.

Laryngectomized patients are taking their places in the community and are performing their daily duties satisfactorily. —*Robert Paradny, M.D.*

Tumor of the Carotid Glomus (I tumori del glomo carotideo). GIOVANNI D'ERRICO. *Gior. ital. chir.*, 1955, 11: 564.

THE AUTHOR presents another addition to the growing literature of successfully treated carotid body tumors.

His report, which includes a brief survey of the literature, concerns a 34-year-old female who in the past 2 years noted a hazel-nut sized swelling on the left side of her neck. Associated with the slow growth of the tumor she began to complain of episodes of vertigo which first occurred at intervals of about every 15 days and lasted for several days. The vertigo was accompanied by migraine (left side) with radiation to the side of the neck, with a sense of constriction in the throat, and difficulty in swallowing. An intense feeling of asthenia and a temperature up to 39 degrees C. also occurred. These episodes were not accompanied by vomiting or dyspnea, and between them the patient was relatively well. A deepening of her voice was also noted.

The patient had received in various clinics intense antibiotic therapy with no effect, and a gingival abscess was treated without significant change. Upon her entry into the author's clinic she was found to be in good general condition; a chest film, blood sugar, and other studies were normal. On physical examination, a mass the size of a small orange was found in the region of the left carotid at the level of the hyoid bone. The mass was spherical in form with a smooth surface and of a hard, fibrous consistency without any pulsation; it would move transversely but not vertically, and was compressible.

Surgery was performed under endotracheal anesthesia. An 8 cm. incision was made along the anterior margin of the sternocleidomastoid muscle. After exposure of the mass it was possible to confirm the diagnosis of tumor of the carotid glomus fused with the carotid bifurcation.

It was possible to dissect the tumor from the involved vessels without ligating any of them and without any significant hemorrhage although this was admittedly difficult. The postoperative course was uneventful aside from some slight drainage from the wound and she was discharged in optimal condition.

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On pathologic examination, the tumor was found to be a bilobed structure measuring 47 by 38 by 33 mm. It weighed 26 gm. and was of a dark red to dark gray color. Microscopic examination with the common stains showed little of the normal structure of the glomus but the structure was rather typical of this type of tumor—a paraganglioma.

The author believes that the episodes of vertigo in this patient were due to the abnormal stimulation of the carotid sinus. Carotid angiography, which would certainly have been useful, was not done because of the absence of pulsations. —*Nicholas Wetzel, M.D.*

Chemodectomas of the Glomus Jugulare (Nonchromaffin Paragangliomas) with Especial Reference to Their Response to Roentgen Therapy. HENRY L. WILLIAMS, DONALD S. CHILDS, JR., EDITH M. PARKHILL, and DAVID G. PUGH. *Ann. Otol. Rhinol.*, 1955, 64: 546.

IN 1941 GUILD described a structure which he called the "glomus jugularis." He stated that this structure was histologically like the carotid body, being composed essentially of blood vessels of capillary or of precapillary caliber with numerous epithelioid cells between the vessels.

Mulligan proposed the term "chemodectoma" as a more descriptive designation of neoplasms arising from paraganglionic tissue. He defined chemodectoma as a neoplasm consisting of chemoreceptor cells which are associated with the distribution of parasympathetic nerves and which originate in the adventitia of blood vessels in structures intimately connected with afferent nerve fibers or along the branches or in the ganglia of the glossopharyngeal nerve. Because of its shortness and convenience, the authors of the complete paper adopted this term of Mulligan's to describe a tumor originating from one of the glomus jugulare structures described by Guild.

Thirteen patients given the diagnosis of chemodectoma of the glomus jugulare at the Mayo Clinic are included in the study. In two cases biopsy was not obtained. The diagnosis of chemodectoma was made from the symptoms and signs, the roentgenographic appearance of the lesion, and the clinical course of the disorder.

Within limits, the histologic appearance of chemodectomas is quite constant. The round or polygonal tumor cells, often designated as "epithelioid," usually have abundant slightly granular eosinophilic cytoplasm and round or oval nuclei with punctate granules of chromatin and small, sometimes multiple, nucleoli. The tumor is highly vascular, and the walls of most of the blood vessels consist of little more than a single layer of endothelial cells. The tumor cells lie in ribbons or nests in intimate association with the blood vessels. Trabeculae of connective tissue traverse the tumor, producing a lobulated or alveolar pattern. The proportion of vascular to epithelioid elements varies; the more vascular tumors may simulate and at times have been diagnosed as hemangioma or hemangioendothelioma.

Symptoms and signs were nonspecific. Roentgenograms of the mastoid and base of the skull were of little diagnostic or prognostic value. Evidence of widespread destruction of the petrous pyramid was helpful in deciding as to operability, however.

It seems possible that the presence of chemodectoma in the middle ear may favor its invasion by pathogenic organisms. It is therefore necessary in a few instances to differentiate chemodectomas from chronic suppurative otitis media.

Chemodectoma must usually be distinguished from cancer of the external auditory canal or middle ear, a neurofibroma of the cerebellopontine angle, a neurofibroma of the fifth cranial nerve in the middle ear, or a primary malignancy of the nasopharynx. The tendency to produce paralysis of cranial nerves certainly gives evidence of a tendency for these tumors to be malignant by position.

In no instance is there clear evidence that surgical measures alone prevented the advance of the lesion. In all cases, when operation alone was used, the advance of the tumor seemed to continue unabated until irradiation was used. The response of chemodectomas to irradiation is slow and the tumor may continue to shrink for several months after treatment. Skin effects from irradiation are minimal. Temporary epilation may occur if hair-bearing tissues are included in the treatment fields. Improvement following surgical intervention always seemed to depend on radium or roentgen therapy.

The authors are of the opinion that it is fair to conclude that radiation therapy has a definite therapeutic effect on chemodectomas of the glomus jugulare. The results seem to indicate that if surgical procedures are used, they should always be combined with radiation therapy. Too little time has passed to conclude that radiation therapy alone is to be preferred for most patients with chemodectoma, but there are indications that in time this will prove to be true.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Vertebral Angiography: Percutaneous Lateral Atlanto-Occipital Method. HENRY A. MASLOWSKI. *Brit. J. Surg.*, 1955, 43: 1.

A SAFE AND RELIABLE method of vertebral angiography, comparable to common carotid angiography, has not yet been developed, as is indicated by the numerous methods described in the literature. What may be safe may not be reliable or feasible, or vice versa. The author describes a method which he has employed in 104 cases since 1950. The method failed in 11 cases, and it is believed that one death has been caused by the vertebral angiography and that a temporary arteriovenous fistula may also have been produced.

With this method, the vertebral artery is punctured as it winds around the lateral mass of the atlas, the line of approach of the puncturing needle being a lateral one in the plane of the tip of the mastoid process. The author claims that the artery was almost "without exception" entered within the first minute or two, but not always squarely enough for injection. This method would appear to be quite feasible and safe since the puncture is done at such a point that the cerebral structures are protected by the lateral mass of the atlas.

In conclusion, the author states: "We trust that though our method has not proved infallible, a high proportion of successful angiograms justifies a wider trial. Even if it may not be equally successful in other hands, I believe that it will become an important aid to the neuroradiologist and the neurosurgeon. Having two or three reasonably successful methods of examination at our disposal, we should rarely fail to secure satisfactory vertebral angiograms."

—*Nicholas Wetzel, M.D.*

The Behavior of the Pial Vessels During and After the Intracarotid Injection of Roentgen Contrast Media. H. W. SCHMIDT. *Acta radiol.*, Stockh., 1955, 44: 100.

THE AUTHOR reports a series of experiments in which various contrast materials were injected into the carotid system and the pial vessels were observed microscopically. Cats and rabbits were anesthetized with urethane and the contrast material was injected through an exposed carotid vessel while the blood pressure was recorded from the femoral artery. Photomicrographs of the exposed pial vessels were made. No evidence of pial vasospasm was observed with any of the substances used, but with higher concentration of the contrast media circulatory disturbances consisting of a momentary arrest of blood flow did occur. Later vasodilation likewise was not observed in any of the animals.

The author believes that the reports of vasospasm on the basis of cortical blanching should be attributed to the momentary arrest of cerebral circulation during which the arterioles are filled with the concentrated contrast media which he has observed microscopically. In his experience, a drop in systemic pressure almost always occurred. There was no difference between the various media containing iodine as compared to thorotrast. The retardation of blood flow is believed to be due to hypotension associated with changes in viscosity. —*Nicholas Wetzel, M.D.*

Collateral Cerebral Circulation Through the Ophthalmic Artery and Its Efficiency in Internal Carotid Occlusion. RENZO BOSSI and CARLO PISANI. *Brit. J. Radiol.*, 1955, 28: 462.

THE AUTHORS report in considerable detail three examples of carotid thrombosis in which it was possible to demonstrate a collateral circulation through the ophthalmic artery. In 2 cases the thrombosis was unilateral and in the third case, bilateral. They discuss the other possible forms of collateral cerebral circulation, i.e., through the circle of Willis and through the meningeal vessels. They do not believe that demonstration of a collateral circulation can form the basis of an optimistic prognosis, since such circulatory channels may not be functionally adequate and may be late in forming, i.e., after cerebral damage has occurred. It is their impression that a valid prognosis can be achieved only if other factors such as the status of the cardiovascular system, the status of the electroencephalogram, and the state of the cerebrum, as shown by the pneumoencephalogram, are also considered. —*Nicholas Wetzel, M.D.*

Insidious Thrombotic Occlusion of Cervical Carotid Arteries Treated by Arterial Graft; a Case Report. FRANK R. DENMAN, GEORGE EHNI, and W. S. DUTY. *Surgery*, 1955, 38: 569.

THE CASE HISTORY here reviewed lends good support to the authors' argument that thrombosis of the cervical carotid arteries is a frequent, often unsuspected, cause of "stroke," unexplained encephalomalacia, so-called "spasm" syndrome of the brain, and other progressive syndromes featuring aphasias, extremity sensory disturbances, hemiparesis, monocular blindness, and hemianopsias. They feel that it may even simulate neoplastic disease.

While the condition is commonly looked upon as so insidious as to be almost undiagnosable, it is believed that one of the reasons for this attitude is that the vessels simply are not examined in the usual physical examination. Digital palpation of the carotids, either on the skin of the neck or intraorally at the tonsillar bed, will usually give accurate evidence of any pulsatile loss. If the arteries are obliterated on one side, then strong compression on the opposite side will produce easily recognized pallor of the retinal vessels, or may even precipitate a sharp neurological change in the patient.

Treatment by anticoagulant and vasodilator drugs offers but little help once the thrombosis is well established. The thrombus steadily propagates from its point of origin, usually an arteriosclerotic patch. Thrombo-

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endarterectomy has not generally been successful. The authors describe their treatment of an unusual situation in a 59-year-old man in whom first the left, and later the right, carotid artery was found to be obliterated. At the first operation the left external carotid artery was ligated and the bulb resected, together with the distal portion of the common carotid, the proximal portion of the internal carotid, and the contained thrombus and arteriosclerotic lesion. The common and internal carotids were then anastomosed with a homologous arterial graft, later proved patent by arteriography, with marked neurologic improvement in the patient. Subsequent deterioration was experienced by the patient, that time with signs referable to the right side of the brain. At operation the right internal carotid artery was found to be solidly thrombosed from bulb to base of skull. Therefore, a graft was inserted between the common carotid and the normal, patent external carotid. Again the patient showed marked neurologic improvement. The value of the operation lies in the preservation of yet intact neurologic function and the prevention of further deterioration, since cerebral tissue once already lost through ischemia obviously is beyond restoration.

—*John Martin, M.D.*

Thrombosis of the Internal Carotid; Substitution of the Ophthalmic Artery (Thrombose de la carotide interne; suppléance par l'artère ophtalmique). L. CHRISTOPHE and S. THIRY. *Neurochirurgie*, Par., 1955, 1: 110.

THE FREQUENCY of thrombosis of the internal carotid artery, anywhere along its extracranial or intracranial course, has come to be recognized as of more frequent occurrence than was formerly thought to be true. The symptomatology of this lesion varies so greatly from patient to patient and, indeed, at times within the same patient, that its diagnosis may be difficult, even with arteriography. Along with others, these authors point out that in the patient with signs of such thrombosis, and yet without evidence of complete loss of function through the carotid, the affected hemisphere may receive blood at the point of origin of the intracranial branches from (1) anastomoses between the external maxillary and ophthalmic arteries, by way of the angular artery; (2) anastomoses between the temporal and ophthalmic arteries, by way of the supraorbital arteries; and (3) anastomoses between the middle meningeal and ophthalmic arteries, by way of the lacrimal and nasociliary arteries.

In a review of their experience with a patient who was proved arteriographically to have thrombosis of the left internal carotid, they demonstrated quite well that the anterior and middle cerebral arteries of the left side of the brain received blood from anatomoses between the facial, angular, dorsonasal, and ophthalmic arteries; from anastomoses between the internal maxillary, pterygopalatine, infraorbital, and ophthalmic arteries; and from anastomoses between the supraorbital and zygomaticoorbital branches of the superficial temporal artery and the palpebral arteries which communicate with the ophthalmic artery. They noted, however, that firm pressure over the *right* carotid in the neck produced sudden and severe signs of left cerebral deprivation, and concluded that while anastomoses do exist on the left side and are of importance to the ipsilateral, defective circulation, probably the affected hemisphere is mainly dependent upon the integrity of the anterior communicating artery. They believe that the variations of these anastomotic possibilities may account for the protean symptoms of carotid thrombosis.

—*John Martin, M.D.*

Successful Ventriculo-Cysternal Drainage After the Manner of Torkildsen in an Instance of Hydrocephalus Internus Obstructus (Erfolgreiche ventrikulo-zysternale Drainage nach Torkildsen bei Hydrocephalus internus obstructus). B. HUMMEL. *Muench. med. Wschr.*, 1955, 97: 973.

THIS 4 MONTHS'-OLD Persian male child, when admitted to the clinic of the Imperial Iranian University at Shiraz, Persia, had a cephalic circumference of 56 cm. This infant lay motionless on the examination table with closed eyes, and apparently was deaf. The pupils of the eyes did not react to light, and the eye grounds disclosed a bilateral choked disc. The child cried continuously. In comparison with the monstrous head, the face and the rest of the body appeared to be underdeveloped.

The child was operated upon with use of the technique proposed by Torkildsen (SURG. GYN. OBST., INTERNAT. ABSTR. SURG., 1951, 93: 31). An acrylic tube was used instead of the previously employed rubber tube. The tube was made as short as possible, to avoid pressure on vital structures, and was provided with cuffs to prevent its becoming easily displaced. The author believes that the drainage tube may be made a close fit; the diameters traversed by this tube do not change much with future body growth.

Six months after the operation the fontanelles presented a sunken appearance and were even then reduced to approximately half their previous size; the cephalic circumference was 53 cm. The eyes were open and the child looked about in normal fashion, saw objects, and reached for them. He no longer cried or reached towards his head, as though suffering from headache. The pupils of the eyes reacted normally to light. The eye grounds appeared to be normal, except for some evidence of retinal atrophy resulting presumably from the previous conditions of edema and congestion.

The psyche has been altered as though by magic. The previously whimpering child now laughed, clapped his hands, and evidently heard everything quite well. Two roentgenograms in the original text show the acrylic tube in place, and photographs show the child, 6 months after the operation, in attitudes normal for those of a healthy child.

On the basis of the results obtained in this case, it is believed that consideration of the operation of Torkildsen should be a prerequisite to any form of treatment.

—*John W. Brennan, M.D.*

Physiologic Observations Following Total Hemispherectomy in Man. GEORGE M. AUSTIN and FRANCIS C. GRANT. *Surgery*, 1955, 38: 239.

THE AUTHORS outline the previous literature regarding total hemispherectomy and come to the conclusion that it has been undertaken only a relatively few

times, since most so-called hemispherectomies to date are really hemidecortications including a great deal of white matter, but largely leaving untouched the underlying basal ganglion. The reasons for undertaking hemispherectomy were possibly to circumscribe large cerebral malignancies which already had produced hemiplegia, and, in addition, the authors wished to evaluate the procedure from a physiologic standpoint, to determine just what, if any, was the psychological and neurological deficit following a really complete hemispherectomy with the exception of the thalamus.

The operation was carried out on 4 patients with no operative mortality. Postoperatively there was relatively little change in intellectual ability, although there was a good deal of personality change and alterations in the realm of perceptual thought. Electroencephalograms taken before and following hemispherectomy showed that where there was an abnormal recording on the side opposite the malignancy, this was usually improved in both frequency and wave form following the hemispherectomy, which suggested that the damaged hemisphere had a deterrent effect on the good hemisphere.

It was interesting to note that whereas pain and touch sensation were both markedly impaired immediately following the operation, by the end of a month's time pain had usually returned to normal threshold. This was in spite of the fact that thalamic sections, made on one patient who died 2.5 months following the operation, showed almost complete degeneration of the sensory thalamic nuclei on the side of the hemispherectomy. The authors believe that pain sensation returns to normal due to the fact that it has bilateral representation through a lower crossing tract in the posterior commissure which is able to re-establish strong synaptic connections in the sensory nuclei.

SPINAL CORD AND ITS COVERINGS

Multiple Ruptured Lumbar Discs. RALPH B. CLOWARD. *Ann. Surg.*, 1955, 142: 190.

THE PRESENT article is essentially a plea for the use of discography, in place of, or as a supplement to, myelography in the preoperative study of intervertebral disc lesions. The author feels, as does many another neurosurgeon, that one of the possible reasons for the all too common failure of surgery to offer lasting relief to the patient with an intervertebral disc lesion is that one or more discs may be involved, and but one is surgically attacked. The author points out that whereas myelography will show only the herniated and extruded disc, discography will demonstrate the disc which is ruptured within the intervertebral space, with resultant alteration in weight-bearing mechanics and consequent pain. It is his practice to use from 6 to 10 c.c. of contrast medium in myelography, and to examine the patient in the standing as well as the horizontal position. Discography is apparently used by him in most disc investigations. When two or more pathologic discs are found by preoperative study, surgery is directed at the removal of all affected discs, since it is impossible, he believes, to determine preoperatively just which disc thus roentgenographically shown is producing the pain and neurologic changes—dermatome representation being as unreliable as it is.

Age distribution was found to be about the same in multiple as in single lesions. Among 206 patients in whom both myelography and discography were used, 33 had multiple disc lesions. (Thirty patients had double lesions; 3 had lesions of the last three lumbar spaces.) There was nothing unusual about the sex incidence. The multiple lesions were verified by myelography in 13 patients, and by discography in 20 patients. The degenerated disc within the interspace was the most frequently found pathologic type, and it is the one typically shown by discography.

This author's operation for pathologic discs is well known to all neurosurgeons, in that he follows disc removal with insertion of bone bank or autogenous bone plugs between the vertebral bodies, to effect fusion.

The complications associated with operations for multiple disc lesions were greater than with operations for single disc lesions; for instance, there was a postoperative infection rate of 9 per cent for the multiple disc operations as compared to 4.2 per cent for the single lesion operations. Twenty-nine of the patients remain symptom-free; one patient died; one patient is incapacitated from postoperative arachnoiditis; one back failed to fuse and the patient still has pain; and one patient (compensation case) still complains of pain.

In the reading of this article, which is based upon a wide clinical experience, one is reminded that the conservative and radical "disc operators" have by no means yet reached a common thinking ground, and that there still exists the danger that the operation performed may, in part at least, be done because of the x-ray findings rather than actual pin-pointed clinical signs and symptoms. —*John Martin, M.D.*

A Gastrocystoma of the Spinal Cord. GEOFFREY KNIGHT, TREVOR GRIFFITHS, and IOLO WILLIAMS. *Brit. J. Surg.*, 1955, 42: 635.

CONGENITAL intradural tumors of the spinal levels other than dermoids and epidermoids are rare, and in the majority of the recorded examples there are but two of the primary germinal layers represented, the ectodermal and the mesodermal. Intestinal-type tissue has been recorded only once, in 1934, by Puussepp.

The authors' patient was a 15-month-old child in whom a tentative diagnosis of meningoencephalitis had been made, but extensive neurologic changes still were not compatible with that diagnosis. Roentgenographic studies eventually revealed developmental abnormalities in vertebrae C. 7 through Th. 7, with gross enlargement of the neural canal in much of this region. At operation a 3.5 cm. tumor was removed from within the anterior portion of the spinal cord, being intimately connected in places with neural tissue. Following operation there was marked improvement in the patient's general and neurologic condition.

On cut section the tumor was extensively cystic on the interior, the cystic spaces being lined with well developed functional-appearing upper alimentary epithelia, thrown into typical folds and surrounded by smooth muscle. Gastric glands containing parietal and chief cells were present. It was believed that this mass was the only one of its kind as yet reported, that it was a gastrocystoma of the spinal cord, and that the

"tumor" was actually a simple developmental heterotopia due to the isolation of a bit of the developing entoderm before the fusion of the scleroderms.

—*John Martin, M.D.*

Analgesic Postures in Sciatica (Les attitudes antalgiques dans la sciatique disco-radiculaire commune). S. DE SÉZE. *Sem. hôp. Paris*, 1955, 31: 2291.

THE AUTHOR states that patients with sciatica often present themselves with typical postures. These postures have been described by Charcot, by Babinski, and since then by numerous other observers.

In a clinical study, he describes the *crossed type* as being commonly composed of two elements; in the frontal plane a lateral movement of the trunk to the healthy side and in a sagittal plane with an obliteration or reverse of the lumbar curve with forward flexion of the trunk. He then describes the movements which are, or are not, possible for such a patient and he further describes the spasm of the paravertebral muscles on the affected side.

In the *direct form* there is an inclination of the trunk towards the side of the sciatica. This form is less common than the preceding of which it is a minor image.

In the third or *alternating type*, even more rare, the inclination of the trunk is susceptible to change from one moment to the next. In this type the patient can sometimes change his tilt from one side to the other at will, but to do so he must flex his lumbar spine and so exaggerate the lumbar kyphosis.

Lastly, there is the pure *kyphotic form* without lateral flexion. This type is quite rare.

The author feels that analgesic postures are much more common in lesions of the fifth lumbar interspace than at the first sacral interspace, and that in lesions of the fifth lumbar interspace there are twice as many examples of the crossed type of posture as the direct. He does not believe, however, that these differences are enough marked to be of diagnostic value.

In the radiologic study of these patients, films taken in the erect position are of great importance. Radiographs taken in the frontal view permit a study of the general morphology of the analgesic posture. With a series of maneuvers involving lateral flexion to either side much information as to the site of the herniation can be obtained. In lateral views with hyperextension and flexion, similar information can be obtained.

In an anatomophysiologic approach to these postures the author suggests that as far as the physiology is concerned, two concepts are of value: (1) the comparative mobility of the last two lumbar vertebrae, (2) the influence exerted by the movements of the spine on the posterior portion of the intervertebral disc. The fifth lumbar vertebra has but little motility in the lateral direction but is quite mobile in the frontal plane. On the contrary the fourth lumbar vertebra is mobile in both planes. Thus the L4-L5 disc has a much greater tendency to herniate laterally. Myelography done upon patients with sciatica would indicate that the myelographic defect can be made to appear and disappear with movements of the back and that these changes can be correlated with changes in pain experienced by the patient during the procedure.

The author then discusses the situation of the nerve root and its relation to the herniation of the disc. He believes that the various analgesic postures represent attempts on the part of the body to relieve the pressure on the nerve root. This may be achieved either by reduction of the herniation or by displacement of the root itself. Another mechanism mentioned is that of relaxation of the tension on the nerve root itself. Reduction of the herniation is believed to be achieved through forward flexion while displacement of the nerve roots or relaxation of tension on the roots is achieved through lateral movement.

—*Nicholas Wetzel, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Treatment of Cancer of the Breast by Simple Mammectomy Associated with Physiotherapy (Traitement du cancer du sein par mamectomie simple associée à la physiothérapie). J. REBOUL, R. TRAISSAC, G. DELORME, and P. BOUYSSOU. *J. méd. Bordeaux*, 1955, 132: 565.

THE METHOD here proposed for treatment of cancer of the breast is not claimed as an innovation. It has evolved only as a correction of gaps and weaknesses demonstrated in other accepted methods of treatment. With the contributions of the English school in 1948 concerning precision methods in the administration of Curie puncture it became possible to calculate doses by a complex system of needles. The method here described for the treatment of cancer of the breast in stages 2 and 3 includes the maximum use of the favorable elements of preoperative radiotherapy, the advantages of simple mammectomy as compared with the Halsted operation, and the favorable effects of radium on the evolution of cancer, the new technique permitting an adequate and homogenous dosage.

Following a review of the advantages and disadvantages of radical surgery, radiotherapy before and after operation, surgery and radium, and of simple mammectomy plus radiotherapy, the principles of the proposed method of treatment are presented. A more detailed description of the technique will be published later.

The preoperative therapy begins with a thoracic semiteleroentgen treatment covering the entire thorax (200 kv., focus skin distance 1.20 m., filter 1.5 mm. of copper plus 1 of aluminum, 75 to 100 roentgens per sitting), in ten daily exposures to a total of 750 to 1,000 roentgens. This is the standard treatment, to which is added in cases with enlarged axillary glands an axillary dose of 200 kv., 150 roentgens per sitting up to 1,500 roentgens, or a total axillary dose of 1,500 plus 1,000 or 2,500 roentgens. Following this first treatment an interval of 1 to 2 months is permitted to elapse with careful observation of the patient. Surgery may be undertaken when two successive examinations at intervals of 15 days show regression of the tumor and adenopathies.

The second stage of therapy consists of a mammectomy with a Halsted incision to the axillary cross, which is exposed with meticulous examination of the blood vessels to facilitate later needling.

The principal stage of treatment consists in radiopuncture. A primary needling is applied according to the rules of R. Patterson, which permits a sufficient and homogenous dosage. The second needling is placed roughly perpendicular to the first from the anterior axillary line to the posterior axillary line. Definite rules are followed in needling the axillary pyramid with the arm raised. The dosage first used for irradiation of the zone where the lymphatics cross the clavicle was considered too weak. At present a stronger dose is applied by using long 5 mgm. needles which are left in place not more than 4 or 5 days. The needles are fixed to fine drains which facilitate extraction without an additional anesthetic.

Once the operation is completed, the wound is sutured, the arm is returned to position, and transcutaneous needling of the supraclavicular region is completed. All needles are left in place for 7 days to insure an average dose of 6,000 roentgens. Two 5 mgm. needles are placed in the vicinity of the supraclavicular drainage of the axillary lymphatics and are left in place 4 or 5 days to provide an adequate dose.

The postoperative course is very simple. There are no serious reactions, and only occasionally is there a little pain in the scar. Most patients are able to use the arm normally after 2 to 3 months.

The authors report their results with this method in 55 cases of cancer in stage 2 or 3 treated since 1948. Since 1954 the supraclavicular and subclavicular doses of radium have been increased.

Of the 55 patients, six were treated more than 5 years ago; nine, 4 to 5 years ago; eleven, 3 to 4 years ago; eleven, 2 to 3 years ago; eleven, 1 to 2 years ago; and seven, less than 1 year ago. The survival without recurrence of those treated less than 1 year ago amounted to 94.6 per cent; of those treated 1 to 2 years ago, 71 per cent; of those treated 2 to 3 years ago, 73 per cent; of those treated 3 to 4 years ago, 65 per cent; of those treated 4 to 5 years ago, 66.6 per cent; and of those treated more than 5 years ago, 50 per cent. However, the number of the latter was too small to permit conclusions. Only statistics from larger series of cases will demonstrate whether the promise apparently offered by this method will be fulfilled.

—*Edith Schanche Moore*

Bilateral Adrenalectomy in the Treatment of Breast Cancer (La surrénalectomie bilatérale dans le traitement du cancer du sein). J. SEROR. *Sem. hôp. Paris, Ann. chir.*, 1955, 8: 485.

THE IMPORTANCE of the role which endocrine therapy plays in the treatment of cancer of the breast is well attested to by clinical and laboratory experience. Treatment with steroid agents may be replaced by castration which considerably increases the percentage of 5 year survivals. Those who advocate castration point to the role of estrogens in experimental carcinogenesis and to the disastrous results in cancer of the breast caused by the inundation of the organism with hormones in the course of pregnancy.

The paradoxical beneficial effect of orchiectomy on cancer of the breast in the male can be explained by the fact that testes secrete a hormone X which exerts estrogenic action, and therefore the operation has the same therapeutic result as oophorectomy in women.

The fact that suprarenal cortex produces estrogenic steroids led to the idea of performing adrenalectomy for the relief of symptoms due to mammary cancer. Histologic studies of the suprarenal glands of patients with carcinoma of the breast reveal signs of either degeneration or hyperactivity. In other words, the supra-

renal glands react in some way to cancerization of the organism. Alterations of the suprarenal cortex in cancer carriers can also be demonstrated by the presence of unusual steroids in their urine. Thus, experimental, anatomicopathologic, as well as biologic findings lend justification to the recommendation of adrenalectomy by Huggins in the treatment of cancer of the breast.

The author draws the following conclusions from his experience with this operation performed on 5 patients.

The subjective amelioration of symptoms, which is spectacular, could be attributed at least partially to the administration of cortisone and to postoperative psychosomatic reactions. On the other hand, no improvement could be detected objectively. Not only did the evolution of the primary tumor continue but new metastases made their appearance. The author concludes that at present adrenalectomy does not deserve a place in our armamentarium against cancer of the breast.

—Joseph K. Narat, M.D.

TRACHEA, LUNG, AND PLEURA

Rupture of the Thoracic Trachea and Major Bronchi Following Closed Injury to the Chest. Victor Richards and Roy B. Cohn. *Am. J. Surg.*, 1955, 90: 253.

The authors point out that while rupture of the thoracic trachea or major bronchi following closed injury to the chest is a comparatively rare accident, the recognition is important because, if treated early, the treatment may be curative and life-saving. The authors describe their experience with 3 cases of this type of injury.

The clinical picture of this injury is divided by the authors into early, later, and late stages. In the early stage, leakage of air and blood characterize the early symptomatology, and the degree of shock and respiratory distress varies with the amount of air and blood lost. If the trachea ruptures into the mediastinum, mediastinal and suprasternal emphysema appear. If the pleura also is torn a tension pneumothorax develops, with dyspnea and respiratory distress. A progressive uncontrolled tension pneumothorax which will not yield to under-water needle aspiration or even catheter aspiration demands immediate thoracotomy since this, according to the authors, is the cardinal sign of a ruptured trachea or bronchus.

If the patient survives the initial injury without the necessity of emergency surgery, respiratory distress may follow the tracheal injuries within a period of from 7 to 10 days. If bronchoscopy is performed the recognition of a granulation tissue membrane protruding into the tracheal lumen may be diagnostic of a displaced segment of tracheal wall with hematoma formation around it. Reparative surgery at this stage again seems indicated. If the lesion has occurred in a main stem bronchus, atelectasis with marked mediastinal shift occurs.

In the late stage tracheal stenosis with respiratory distress follows continued conservative management of tracheal injury. Late repair of the trachea becomes necessary. The authors believe, in general, that good results are obtained from early repair of these injuries, and that in the later cases any significant degree of bronchial displacement or incipient stenosis should be treated by open thoracotomy with direct suture of the injured bronchial or tracheal wall.

In the late stages the problems are extremely difficult and often insurmountable. The bronchial lesions may be resected with end-to-end anastomosis; however, if infection has been superimposed upon an atelectatic lung, lobectomy or pneumonectomy may be necessary. The most difficult cases are those with late stenosis of the trachea near the carina.

—John H. Schneewind, M.D.

An Analysis of Unfavorable Results in the Surgical Treatment of Bronchiectasis. Robert L. Ginsberg, Jack C. Cooley, Arthur M. Olsen, and John W. Kirklin. *J. Thorac. Surg.*, 1955, 30: 331.

Clinical results in the surgical therapy of bronchiectasis are good. A recent review of 221 cases of bronchiectasis revealed excellent results in 75 per cent. A fair result was obtained in an additional 16 per cent and a poor result in only 5 per cent of this series.

The authors attempted to analyze certain factors possibly responsible for this group of unsatisfactory results. A poor result designates a patient who is little improved or is worse following operation. Age, sex, and hemoptysis did not preclude a good result. Factors thought to be of major importance included postoperative complications and new bronchiectasis. Factors thought to be of less importance were residual disease, particularly ipsilateral residual disease, bronchiectasis in children, and sinusitis.

Cystic Disease of the Lung (Sulle cisti aeree del polmone). Pietro Cavazzini, Alberto Maestri, and Aldo Pietrantonio. *Medicina*, Parma, 1955, 5: 85.

The authors review the problem of cystic disease of the lung. They believe that approximately one-fifth of these cysts contain mucus but are easily converted to gas-containing cysts by evacuating their contents into the bronchial tree. Mucous cysts were found to be lined by respiratory epithelium while gas-containing cysts frequently had no epithelium.

Large pulmonary cysts sometimes produced dyspnea and hemoptysis but more frequently they were asymptomatic.

Isolated cysts were more common in the lower lobes while multiple cysts and emphysematous bullae were usually to be found in the upper lobes.

The difficulties in classifying the various manifestations of this condition are discussed, and a patient with a large gas-containing cyst which proved to be an old evacuated abscess is presented to illustrate the difficulty and fallacy of any rigid, formal classification of cystic disease of the lung.

—George L. Nardi, M.D.

A Critical Comparison of Bronchoscopy, Bronchography, and Angiopneumography in Bronchial Carcinoma (Ein kritischer Vergleich zwischen Bronchoskopie, Bronchographie, und Angiopneumographie beim Bronchialcarcinom). H. J. Hoffheinz. *Thoraxchirurgie*, 1955, 3: 139.

The material on which this comparative study of bronchoscopy, bronchography, and angiopneumog-

raphy is based consisted of 25 cases of cancer of the bronchus. Four of the cases are reported in detail with the exploratory films and angiograms; however, the author states that these are merely representative cases.

The remaining material was arranged in tabular form which showed that the diagnosis of bronchial cancer could be established by angiopneumography alone in every instance here considered. In 19 of 21 patients examined bronchographically, the diagnosis could be established by this method alone and in only 13 of these 19 patients the presence of carcinoma could be established by bronchoscopy alone.

In the matter of nonoperability it was shown that this question could be answered angiopneumographically in 10 of the 25 patients examined: among the 21 examined bronchographically this question could be answered by this method in only 1 instance; among the 19 patients examined bronchoscopically the question was again answered in only 1 instance.

Of the tumors examined angiopneumographically and considered to be nonoperable, there was only one that was found to be operable on exploratory thoracotomy. In every instance in which, on the basis of the bronchographic or bronchoscopic findings, the condition was adjudged to be nonoperable, the angiopneumographic findings could be interpreted in the same sense.

Thus, a comparison of the three methods of examination showed that not only is the method of angiopneumography practically superior to the methods of bronchography and bronchoscopy in the matter of determination of the problem of operability versus nonoperability, but the angiographic technique will permit the demonstration of less advanced neoplastic processes.

Certainly angiopneumography has shown itself to be an extremely reliable diagnostic procedure and it affords the best results in evaluating the question of operability versus nonoperability of bronchial carcinoma. This method has the further advantage in that it is able to detect the presence of the neoplasm, not alone in relationship to the bronchus but also to those tumorous masses lying free in the pulmonary parenchyma; this ability is especially valuable in the matter of peripherically located lung cancer. The tumor mass is seen in its entire extent, while bronchography and bronchoscopy, at most, uncover the proximal end of the malignant tumor in the bronchial system. It is in this regard that the author explains the 2 instances in which the bronchographic method did not afford unequivocal evidence of the presence of bronchial cancer, and yet the process had already infiltrated the lung tissues so widely that characteristic findings could be elicited angiopneumographically.

On the basis of the author's experience he recommends angiopneumography as an exact method of study. —*John W. Brennan, M.D.*

Radical Pneumonectomy for Bronchial Carcinoma. Russell Brock and L. L. Whytehead. *Brit. J. Surg.*, 1955, 43: 8.

Since 1947 the authors have been performing a radical operation for bronchial carcinoma, consisting of a block dissection of the mediastinal lymph nodes in addition to total removal of the lung at the site of origin of the main bronchus and vessels. This report is the first account of the details of the operation and its results.

An extensive discussion of the lymphatic anatomy of the lung with ample illustration is given, and the authors call attention to the great necessity of steps designed to prevent vascular spread of the tumor at the time of operation. The complete technical procedure is then described, again with excellent illustrations.

The immediate mortality rate in this series of 145 radical pneumonectomies was 11 per cent, a figure that compares favorably with world statistics for routine pneumonectomy for carcinoma. In fact, during this same period covered in the reported series, 49 simple pneumonectomies were performed by the same group of surgeons in the same institutions and in this series the mortality rate was 18 per cent.

It may be said that an extensive radical operation of this nature is often not justified in the presence of advanced malignant disease. This is a matter of surgical policy and philosophy that can be answered only by the individual surgeon. These authors believe that in dealing with a disease like cancer, especially cancer of the lung, bold and radical measures are both indicated and justified, but of course this does not mean that they embark upon foolish and desperate attempts to resect irremovable growths. They merely emphasize that a surgeon should not turn away too readily from his task when a more radical method is available to him which enables him to deal effectively with a wider range of malignant cases.

That this policy is justified has been shown by a number of their individual cases. Their first subject, operated upon by the radical procedure in 1947, was alive and well at the time of their report. In this instance they found a large growth in the right upper lobe associated with a large malignant mass of lymph nodes in the right tracheobronchial fossa. Removal of these nodes entailed resection of the vagus nerve high in the chest. The malignant metastases were proved histologically in this 43 year old man. Again, in 1948, a radical pneumonectomy in a man aged 50 produced an unexpected amount of palliation. A large malignant mass in the right upper lobe was associated with gross enlargement of all of the nodes in the right tracheobronchial fossa. A complete extirpation was carried out with considerable difficulty because of the encroachment upon the superior vena cava. The vagus nerve was included in the block dissection. Deep x-ray therapy was given for this very anaplastic carcinoma which had spread to nearly all of the excised nodes.

The patient remained well and worked full time for three years after the operation before recurrent or residual tumor carried him on a downhill course in 1951.

These surgeons call our attention to their observations that many of the patients who eventually succumb to malignancy after the radical pneumonectomy are found to have blood-borne tumor rather than lymphatic-borne spread. Thus, they feel that in many cases hopeless progressive mediastinal residual tumor is prevented.

Again in comparing the series of radical pneumonectomies with simple routine pneumonectomies, these authors find that in the latter group only 18 per cent of the patients are still alive, whereas in the former 50 per cent are now living.

A method of charting and examining the excised lymph nodes after the radical operation is described in the article, and this method, along with the important step of ligation of the pulmonary vessels inside of the pericardial cavity, can be found in detail in this excellent presentation. —*Matthew H. Evoy, M.D.*

Cardiorespiratory Function in Pulmonary Surgery. CARL SEMB, HARALD ERIKSON, FRANK BERGAN, and CARSTEN MÜLLER. *Acta chir. scand.*, 1955, 109: 235.

AN INVESTIGATION of the cardiopulmonary function of patients is very helpful to the thoracic surgeon preoperatively. The information obtained may be of diagnostic importance in differentiating between dyspnea of pulmonary, and that of circulatory origin. When planning operative intervention and considering its effect on cardiopulmonary function detailed information is necessary regarding the function of each separate lung, the relation of this to the function of the ribs and the diaphragm, and the relation to the pathological changes in the bronchial tree, the lung tissue, and the pleura. A special problem is connected with the lesser circulation as in addition to its role in the total cardiopulmonary function it may give rise to secondary heart lesions, especially the so-called "cor pulmonale." Thus, the evaluation of the cardiopulmonary reserve is of importance for determining the immediate risk of the operation and to predict the cardiopulmonary function in later life.

The results of cardiopulmonary tests often decide the choice of operative procedure and also help to determine the value of the different operative procedures in regard to the cardiopulmonary function. The authors have concluded that cardiopulmonary function tests should cover both the bellows function and the respiratory gaseous exchange combined, and for each lung separately, as well as the lesser circulation and the secondary biochemical changes in the blood.

The cardiopulmonary response to exercise was determined by spirometric recording of the respiratory gaseous exchange before, during, and after a short standardized exercise. The relative lung function was investigated with bronchospirometry on approximately 300 patients suffering from pulmonary tuberculosis, bronchiectasis, and cancer. The conventional Collin spirometers and specially designed plastic tubes were used in the investigation and the results illustrated. The circulatory effect of pulmonary disease was studied, and the results of this investigation indicated that pleural changes, either due to pleurisy or previous artificial pneumothorax, particularly bilateral, impair the pulmonary circulation considerably. Previous apical thoracoplasty does not significantly reduce the pulmonary vascular bed if it has not been complicated with pleural changes or reduced mobility of the diaphragm. It is advisable that types of treatment that will result in further reduction of the pulmonary vascular bed should be used with caution on patients with latent pulmonary hypertension and avoided on patients with manifest pulmonary hypertension.

The determination of cardiopulmonary function is important not only preoperatively but also postoperatively. The respiratory insufficiency may be due to reduced bellows function or reduction of lung tissue, and will then lead to hypoxia as well as carbon dioxide retention, or to a development of arterial venous shunts due to infiltrations especially by complicating pneumonia which can lead to hypoxia without retention of carbon dioxide. The authors have pointed out that if removal of secretions postoperatively is insufficient to correct respiratory insufficiency with carbon dioxide intoxication, artificial respiration should be instituted, and they have used with success the iron lung in 3 patients who were in coma due to temporary grave respiratory insufficiency. In their experience they found that the most common type of respiratory insufficiency was due to reduced bellows function or lung surface, and in these cases the alkali reserve is a good indicator of the degree of insufficiency. Determination of the alkali reserve is therefore done frequently in the postoperative phase and is supplemented with arterial blood gas determination only in cases in which there is definite suspicion of arterial venous shunting. It is often not possible to detect the development of respiratory insufficiency with reasonable certainty by the appearance of the patient or blood pressure measurements. The authors have been able to reduce the operative mortality 1 to 2 per cent by recognizing respiratory insufficiency during various studies of the alkali reserve postoperatively. Thus, the blood gas examinations for control and treatment of postoperative respiratory insufficiency are suggested as the most valuable in the postoperative period.

—*John E. Karabin, M.D.*

HEART AND PERICARDIUM

The Selection of Patients for Surgery in Acquired Heart Disease. PAUL WOOD. *Brit. M. Bull.*, 1955, 11: 203.

THE AUTHOR presents a review of the status of cardiac surgery in the following categories: (1) wounds of the heart, (2) massive pulmonary embolism, (3) Pick's disease, (4) ischemic heart disease, (5) mitral stenosis, (6) mitral incompetence, (7) aortic stenosis, (8) aortic incompetence, and (9) tricuspid stenosis.

For Pick's disease pericardiectomy should be undertaken in all cases of chronic constrictive pericarditis (at least up to the age of 65) that would otherwise require medical treatment (apart from digitalis in cases with auricular fibrillation), but it should be deferred as long as possible when tuberculosis is clearly active. The only absolutely pathognomonic sign of Pick's disease under the appropriate clinical circumstances is pericardial calcification.

As far as mitral stenosis is concerned, the incidence of re-stenosis after operation will not be known for many years, but thus far it seems to be about 2 per cent per annum. Thousands of patients have been successfully relieved of their stenosis, and parallel medical studies have placed the selection of cases on a firm scientific footing. The operative mortality is about 5 per cent and the results are excellent or good in three-quarters of the patients. In general, any patient who is suffering from the effects of mitral stenosis

requires valvulotomy, and any patient who is able to carry on his normal occupation without distress usually does not need surgery. Cardiac catheterization may be required to prove whether mitral stenosis is severe enough to warrant valvulotomy when the clinical features are indecisive, to distinguish dominant mitral stenosis from incompetence or left ventricular failure, and to demonstrate the cause of extreme pulmonary hypertension when the etiology is clinically in doubt. Straightforward cases of mitral stenosis do not require catheterization.

The surgery for mitral incompetence has not been successful thus far and operations for aortic incompetence are still in the experimental stage.

For stenosis of the tricuspid valve, precise criteria for valvulotomy cannot be laid down until sufficient experience has accumulated.

—Robert Turell, M.D.

The Surgical Treatment of Aneurysm of the Heart (Die chirurgische Behandlung des Herzaneurysmas). FRANZ F. NIEDNER. *Thoraxchirurgie*, 1955, 3: 93.

THE OPERATION for cardiac aneurysm employed by the author in 3 instances differs in detail from the operation performed on 1 patient by Sauerbruch and that performed on an 8 year old child by Derra; however, the general principle is the same in all of them. This consists in exposing the aneurysmal sac and tying off its neck with a purse-string suture, or some modification of the same.

To this technique the author adds a dermal homograft which is taken from the thigh of the patient before the operation on the thorax is started. This transplant is deprived of its epidermal and subcutaneous fatty layers. The pericardial sac is opened to encircle the aneurysm and stay about 1 cm. from its border. The transplant is sewn to the outer edge of the pericardium (the pericardium is usually widely adherent to the aneurysmal sac) under tension so as to bolster the weak spot in the cardiac wall. Of course, it is not applied to constrict the lumen of the large blood vessels and if the phrenic nerve passes over the aneurysm it must, if possible, be dissected free and later replaced on top of the dermal transplant where the remaining subcutaneous fat will form an appropriate envelopment for the nerve trunk. Nevertheless, in one of the author's patients the left phrenic nerve was intentionally lacerated and no unfavorable effects were noted from the consequent paralysis of the left half of the diaphragm.

Following the closure of the chest wall continuous aspiration for 48 hours is advisable. The aspiration is carried out under a negative pressure of 8 to 10 cm. of water. The suction must be interrupted frequently. The secretion during the operation for cardiac aneurysm is more copious than during other intrathoracic operations; however, it does not exceed 500 c.c. on the first and second postoperative days. Occasionally, puncture must be carried out, even as late as the third and fourth week. During the postoperative period the skin transplant seems to act as an irritant in the pleural cavity, producing extensive adhesions with the surrounding structures. This effect disappears in the course of a few weeks without leaving any unfavorable effects.

Of the 3 cardiac aneurysms operated upon, one was located in the region of the ramus descendens of the left coronary artery, another was located in the region of the ramus circumflexus of the left coronary artery, and the third was located in the right auricle at the base of the right atrium. All these operations were immediately successful. Of course, it is still too early to evaluate the definitive results. Especially is it impossible to determine if the life of the patient will be lengthened. On the other hand, it can be definitely stated that the method here described will shield the patient against cardiac rupture, an eventuality that occurs much more frequently than is frequently assumed; further, it can be positively asserted that the method is not especially radical and does not represent any special danger to the patient.

—John W. Brennan, M.D.

Atrial Septal Defect. JOHN W. KIRKLIN and F. HENRY ELLIS, JR. *Surg. Clin. N. America*, 1955, 35: 989.

AN ATRIAL septal defect is frequently a complicated situation. In most atrial septal defects there is a flow of blood from the left atrium to the right atrium, producing a left-to-right shunt that is often of great magnitude. It is characteristic of atrial septal defects that the high flow is accompanied usually by only slight increases of pressure in the pulmonary artery. In some cases, however, pulmonary hypertension does develop over a period of years. Occasionally, when it develops, it is accompanied by a reduction in the left-to-right shunt, and when the pressure becomes sufficiently high the shunt may indeed reverse so that ultimately the predominant shunt becomes right to left.

In a few types of interatrial communication, the predominant shunt is right to left. These include pulmonary stenosis and interatrial communication, Ebstein's malformation of the tricuspid valve and interatrial communication, and so-called idiopathic pulmonary hypertension with a valvular competent patent foramen ovale.

The diagnosis of uncomplicated atrial septal defect may often be made with reasonable certainty on clinical grounds. Usually a systolic murmur is heard over the pulmonary area. Roentgenographic and roentgenoscopic examination of the thorax discloses a large pulmonary-artery segment, absence of a prominent aortic knob, enlargement of the arteries in the hila of the lungs, right atrial enlargement, and some evidence of right ventricular hypertrophy. Complicated atrial septal defects, including those associated with pulmonary hypertension, anomalous pulmonary venous connection and right-to-left shunt are more difficult of diagnosis on purely clinical grounds. Cardiac catheterization is usually required for complete elucidation of the pathologic anatomy in these cases.

Patients who have a left-to-right shunt across an atrial septal defect in excess of 50 per cent of the pulmonary blood flow are considered as candidates for operation whether or not symptoms are present.

Methods of operation range from the completely closed technique of Bailey and Crafoord through the semiopen technique of the atrial well, as reported by Gross, to the methods of open cardiotomy either under hypothermia and inflow stasis or under conditions of the heart-lung bypass. It is likely that different

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methods will continue to be employed by surgeons for closure of atrial septal defects, just as different methods are employed for restoring gastrointestinal continuity after gastric resection. The authors have used the atrial-well technique of Gross with an exceedingly low operative risk. The procedure is well tolerated by the patient. They have learned, however, that under a few conditions the well seems contraindicated. It should not be used in patients with severe pulmonary hypertension in whom there is an elevated right atrial pressure even though the shunt continues to be left to right. It should probably not be used in patients with a right-to-left shunt in whom closure of an interatrial communication is contemplated. In patients with partial persistent atrioventricularis communis, there continues to be some difficulty in selecting the method of approach. It is their opinion that if and when completely safe methods of bypassing the heart and lung are available, these may provide the method of choice for closure of defects of the persistent atrioventricularis communis type. In two instances they have utilized the technique originally described by Bailey, in which a portion of the right atrial wall is sutured down into the defect to obtain a closure. They have had no experience with the technique described by Sondegaard and utilized by Crafoord but consider these two totally closed methods to have some limitations because of the difficulty of complete and accurate closure.

Operation for atrial septal defect may be done with safety in properly selected cases. The results of operation are excellent.

Experiences with the Surgical Repair of Atrial Septal Defects. Elton Watkins, Jr., and Robert E. Gross. *J. Thorac. Surg.*, 1955, 30: 469.

Surgical closure of congenital defects in the atrial septum has proved to be a useful procedure, and, with the evolution of a number of refinements, the mortality has been due exclusively to advanced complicated disease.

The authors believe that the indications are: (a) persistence of incapacitating symptoms despite optimal medical management; (b) persistence of serious cardiac enlargement and pulmonary congestion; or (c) catheterization evidence that right ventricular output was more than twice that of left ventricular output. By such indications patients were selected who had either severe limitation of activity or signs of impending difficulty due to enormous shunting through the diseased septum.

Following development of the atrial well operation, it became evident that the majority of defects seen could be closed by a simpler method of suturing from the outside surface of the intact atrium. The well has proved to be a versatile method for handling defects of large size or anterior position in the septum, but in the last 30 patients only three defects were types which would have required use of the atrial well.

The authors present a classification of the surgical anatomy of atrial septal defects based on 43 defects evaluated at operation. Although the 43 defects have varied greatly in size and shape, they tended to fall into five general categories, depending upon their location in the septum. Certain orifices have been multiple or slit-shaped, but surgical management was similar to the repair of a solitary oval defect in the same location.

Common atrium. In this heart the septum was absent except for small ridges along part of the margin of the common atrial chamber. There was no deformity of the atrioventricular valves. This type of malformation was present in 2 out of the 43 cases.

Endocardial cushion defect (the so-called "ostium primum" defect). This defect was located anteriorly in the atrial septum immediately above the tricuspid and mitral valves. In every defect there was an associated deformity in the valve cusps below the defect. The defect was characteristically small, from 1.5 to 2.5 cm. in diameter, and was seen in 4 cases.

Inferior defect. The inferior type of defect was located close to the inferior caval orifice. The right atrial chamber is shaped like an inverted cone with a broad superior surface bearing the superior caval orifice and the right atrial appendage. Inferiorly the caval orifice extends through the full diameter of the narrow chamber. Consequently, defects low in the septum near the inferior caval orifice extended through the full diameter of the chamber and lay in close juxtaposition to the tricuspid valve ring and coronary sinus. These defects were seen five times in the 43 cases.

Midatrial marginal defect. The commonest type of defect encountered was one located near the posterior margin of the atrial septum adjacent to the roots of the right pulmonary veins about midway between the two caval orifices. It was present twenty-eight times.

Superior marginal defect. Next to the mid-atrial marginal defect, this deformity was the most common It was present in 15 of the 43 cases. The lesion tended to be smaller than the mid-atrial marginal defect and lay in close proximity to the superior caval orifice. External suture closure must be made in such a manner that occlusion of the superior cava is avoided.

This classification has been made with the intention of differentiating those low-lying defects associated with atrioventricular valve deformity from defects without valve deformity lying near the inferior vena cava. Serious regurgitation with the former type of defect has been aggravated by surgical repair. The latter type of defect is amenable to surgical repair but presents technical difficulties in the danger of injury to specialized conduction tissue in the atrioventricular node and bundle. This tissue may be located by palpation of two landmarks within the atrial chamber—the valve of the coronary sinus and the central fibrous body. Conduction tissue is not found posterior to a line connecting these two landmarks.

During the last 22 consecutive cases, deaths have occurred only in the presence of advanced disease—advanced pulmonary vascular obstruction in 2 patients and serious atrioventricular valve deformity in 2 patients. The authors now regard these conditions as contraindications to defect closure.

—*Alan L. Dorian, M.D.*

Closure of Atrial Septal Defects by Atrioseptopexy ad Modum Bailey. Olle Dahlbäck, Inge Edler, Erland Linder, and Philip Sandblom. *Acta. chir. scand.*, 1955, 109: 265.

Atrial septal defects are common congenital abnormalities of the heart and produce symptoms

usually in early adulthood through right heart insufficiency.

In brief, the methods of treatment have been the invagination of the right auricular wall by mattress sutures, dissection of the plane between the two auricles, and then passage of a suture beneath the defect and closure by tying this over a piece of fascia or muscle in the dissected groove between the auricle. Atrioseptopexy involves the use of a portion of the right auricular wall for the closure by means of several sutures passed through the right auricular wall and the edges of the septal defect. These when tied down then invaginate the wall of the auricle against the edges of the septal defect.

Nine patients were operated on by this method and a brief clinical summary of each of the cases is given. The cases were also studied by careful chest x-rays and preoperative and postoperative cardiac catheterization with pressure and oxygen tension measurements. They are divided in 3 categories, the first being a persistent ostium primum, of which there were 2 cases, the second a persistent ostium secundum, and the third a persistent ostium secundum with an anomalous pulmonary vein.

The results were variable, poor results being obtained in the ostium primum type of case, while in the other types the results ranged from poor to excellent.

—Robert W. Williams, M.D.

Mitral Valve Disease and Mitral Valvotomy. J. F. Goodwin, J. D. Hunter, W. P. Cleland, L. G. Davies, and R. E. Steiner. *Brit. M. J.*, 1955, 2: 573.

A study of 75 patients with mitral valve disease is presented. Fifty-eight patients were women and 17 were men, and their ages ranged from 17 to 58 years, the majority being between 20 and 50 years.

A clinical evaluation of dyspnea, orthopnea, bronchitis, hemoptysis, chest pain on effort, embolic phenomena, and congestive failure was carried out. In addition, the physical signs of arterial pulse, venous pressure, and cardiac sounds were assessed.

Fluoroscopy and roentgenography were utilized to study the right and left auricles, the ventricles, and the pulmonary vascular pattern. Cardiography and cardiac catheterization were carried out in the majority of patients.

Mitral valvotomy was carried out in the 75 patients and in each an evaluation of thrombus or calcification in the left auricle or appendage, valvular calcification, the size of the mitral orifice, the presence of mitral incompetence, the split obtained, regurgitation after the split, and biopsy of the left auricular appendage was made.

The results are assessed in 56 of the patients, who have been followed up for 6 months to 3 years.

Critical mitral stenosis could be correlated with the preoperative finding of severe dyspnea and severe pulmonary hypertension. If auscultation revealed evidence of a mobile valve and little calcification, a good split could be predicted.

The condition of the majority of the patients was greatly improved symptomatically after operation, but in only one-third of the patients with good subjective results was there any objective evidence of improvement. Pulmonary vascular disease in two-thirds of the patients with a good result was unchanged by roentgenography. Valvotomy may halt the progressive pulmonary vascular disease but apparently does not reverse it.

There was a good correlation of the degree of dyspnea preoperatively and the final result. In all patients with grade 2 dyspnea a good result was obtained, while only 50 per cent of the patients with grade 3 dyspnea had a good result.

Most of the poor results and deaths (15 per cent) occurred after operation. The production of severe mitral incompetence, tearing of the auricle, ventricular fibrillation, and failure to split a heavily calcified valve were the most common causes. In some patients the age, coronary artery disease, and chronic congestive failure may have caused the operation to fail.

Severe mitral incompetence, intractable congestive failure, predominant aortic valve disease, and active rheumatic fever are contraindications to mitral valvotomy.

—John H. Davis, M.D.

Improved Valvuloplasty for Mitral Stenosis with Discussion of Multivalvular Disease. Dwight E. Harken and Harrison Black. *N. England J. M.*, 1955, 253: 669.

The authors review some of the technical considerations of mitral valvuloplasty which influence not only the mortality but also the quality of the surgery. The discussion is based on an experience with more than 1,000 cases of mitral stenosis to date. Simple dilatation of the mitral valve is inadequate and of only transient value.

The standard lateral hemithoracic incision is used with the patient in a lateral position. A broad area of atrium at the base of the appendage is thus exposed, which provides maximum safety in the control of hemorrhage. This exposure makes possible cardiotomy directly through the atrium when there is no appendage because of atrophy, thrombosis, calcification, or previous operation. Early experience dictated the use of the superior pulmonary vein for entrance when no appendage was present, but all entries are now made directly through the atrial wall when no appendage is present.

Tears of the atrial wall are controlled by tightening the purse string sutures with the finger in the atrium and compression of the tear itself. Gelfoam can be used with gentle compression against the tear to control hemorrhage in this low pressure system.

The chief source of morbidity or mortality is that of embolism, either from the left atrium or calcium from the mitral valve. At the time of manipulation of the appendage and when the finger is inserted to fracture the valve, the circulation to the brain is occluded by means of tapes previously passed about the right innominate, left common carotid, and left subclavian arteries. The occlusion is maintained for 30 to 45 seconds after any maneuver which might release clots. Obstruction of the cerebral circulation should never exceed a minute and a half.

The most important aspect of the operation, second only to patient survival, is the maximal opening of the valve while preventing incompetency. All of the patients had the valve opened to from 3.0 to 4.0 sq. cm.

It has been necessary to reoperate upon 12 of the initial patients because only dilatation had been accomplished initially.

In no case in which a second operation was necessary was refusion of the leaflets the cause; the initial operation had been inadequate in all of the cases.

Secondary stenosis may occur following fusion of the chordae tendineae or the papillary muscle. In more than half of these cases some fusion of the chordae tendineae occurred. In most cases this fusion can be divided by blunt dissection with the fingertip in the direction of the muscle fibers. This maneuver is essential since adequate valvuloplasty has not been obtained until the cause of secondary stenosis has been removed.

Aortic stenosis will occasionally accompany mitral stenosis. To require surgical intervention the aortic lesion should produce an enlarged left ventricle as shown by an electrocardiogram and a delayed upstroke time in the brachial artery tracing. When aortic stenosis is present it is relieved by finger fracture valvulotomy through an operating tunnel sewed on the aorta.

Tricuspid stenosis may also occur with mitral stenosis, but is extremely rare. The relief of tricuspid stenosis when proved is done through the same incision as that for mitral valve stenosis. Because the risk of exploration of the tricuspid valve is low it should be carried out whenever doubt exists.

Excellent descriptions and diagrams of the technical details of the operation are included.

—*John H. Davis, M.D.*

Circumferential Suture of the Mitral Ring; a Method for the Surgical Correction of Mitral Insufficiency. Julio C. Davila, Robert P. Glover, Robert G. Trout, Frank S. Mansure, and Others. *J. Thorac. Surg.*, 1955, 30: 531.

In 18 dog experiments, mitral insufficiency was produced by laceration of the posterior leaflet of the valve or by suturing it to the heart wall. This resulted in a regurgitant jet of blood which could be palpated by the intra-atrial finger or by the gross thrill felt over the surface of the atrium and by typical pressure pulse tracings characteristic of mitral insufficiency. This experimentally produced regurgitation was promptly eliminated by a circumferential suture placed around the annulus which produced constriction of the mitral ring.

In 62 dogs, the effect of the circumferential suture of the annulus was investigated by studies which extended over a period of 6 months. Constriction of the atrioventricular ring of the normal dog heart resulted in minor hemodynamic changes, such as slight elevation in the atrial pressure, a slight drop in the pulmonary pressure, and a fall in the left ventricular and aortic pressure. After placement of the suture a cellular infiltration appeared and was followed by a fibrous envelope over the suture. Damage to the ventricular myocardium did not occur if the sutures were properly placed. Electrocardiograph tracings did not show any changes directly due to the effect of constriction of the ring, but they did indicate such potential hazards as damage to the coronary circulation, conduction defects, or transfixion of a section of cardiac muscle. The latter complications occurred during the course of development of the circumferential suture.

The final technique consisted of the placement of the suture medially into the right atrium ventral to the ostium of the coronary sinus, through the right side of the septum and emerging into the transverse sinus. The segment of suture to be enclosed in the transverse sinus was encased in pericardial tissue. The suture continued on through a tunnel anteriorly beneath the circumflex coronary and great cardiac vein. The posterior tail of the suture traversed laterally and anteriorly through the atrioventricular groove, passed under the lateral branch of the circumflex coronary vein, and emerged through the periannular fat in proximity to the anterior tail where a double square knot was tied. Pericardial bolsters minimized the possibility of erosion into the lumen of the atrium. All varieties of sutures were used and were well tolerated. Mitral stenosis, after tying of the circumferential suture, did not occur if the ring was drawn down to 1.8 to 2.0 cm.

This procedure was given a clinical trial in 7 patients and indicated that mitral regurgitation can be corrected but was dependent on the pathological state of the valve and on the status of the renal, hepatic, and pulmonary functions at the time of surgical interference. —*B. G. P. Shafiroff, M.D.*

Operative Indications in Chronic Constrictive Pericarditis (Les indications opératoires dans les péricardites chroniques constrictives). Charles Dubost and Claude d'Allaines. *J. chir.*, Par., 1955, 71: 852.

There is only one efficient treatment of chronic constrictive pericarditis, namely, cardiac decortication or pericardiectomy.

Of 70 interventions, 62 were done prior to a 6 month period preceding the publication. They were performed on 53 patients, 9 of whom required a second operation. Men formed 64 per cent and women 36 per cent of the entire group. The youngest patient was 13 and the oldest, 58 years of age. Patients in the first 2 decades of life formed 13.2 per cent, those in the third and fourth decades 43.4 per cent, and those in the fifth and sixth decades also 43.4 per cent of the entire series. In 41.5 per cent of the patients a tuberculous origin of the condition could be established. Other probable causative factors were articular rheumatism, septicemia, and trauma, but in 41.5 per cent of the patients no etiology could be established.

Pick's syndrome was present in all cases, and calcifications were visible in the roentgenograms of 57 per cent of the group.

Sinus rhythm was found in electrocardiograms of 54.7 per cent of the group, flutter or fibrillation in 45.3 per cent, and modifications of the T wave in 27.0 per cent.

The operation may be contraindicated in the presence of generalized venous stasis, hypoproteinemia, ascites, hepatic insufficiency, or progressive myocardial insufficiency. On the other hand, surgical intervention is superfluous in calcified, stabilized forms, especially in individuals over 40 years of age. The ideal time for an operation is between 10 and 18 months after the onset of the lesion.

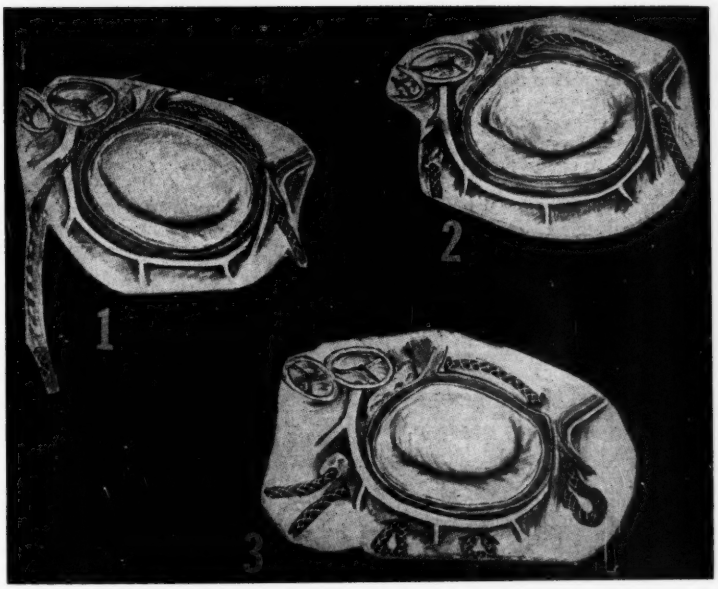

FIG. 1 (Davila). *1*, The medial segment of the circumferential suture placed. A segment of the anterior tail has been wrapped in a pericardial sleeve. *2*, The suture has been pulled back, drawing the pericardium-covered portion into the transverse sinus. The anterior tail has been passed beneath the circumflex coronary artery through the previously dissected tunnel. *3*, The posterior tail has been stitched laterally and anteriorly into the atrioventricular groove to complete the encirclement of the ring.

Complete resection of the pericardium is not indispensable. Equally good results may be expected from a simple biventricular liberation if the entire both ventricles, coronary grooves, valvular orifices, and the origin of arteries at the base are freed.

Extensive horizontal thoracosternotomy is advocated by the authors for a good exposure of the entire heart. Left thoracotomy in the fourth intercostal space is prolonged by a horizontal section of the sternum. Operative mortality occurred in 4 patients, or 6.4 per cent of the series of 53 patients, and postoperative mortality, in 9 patients, or 14.5 per cent. Cure was obtained in 29, or 54.7 per cent, of the remaining patients; improvement was recorded in 6, or 11.3 per cent, and no change in 1 patient, or 1.8 per cent.

—*Joseph K. Narat, M.D.*

Stenosis of the Aortic Isthmus: Coarctatio Aortae (Die Isthmusstenose der Aorta: Coarctatio aortae). E. K. FREY and G. KUETGENS. *Muench. med. Wschr.*, 1955, 97: 970.

THE AUTHORS now have operated upon 10 patients with coarctation of the aorta, without a death and without subsequent complications. Two roentgenograms of one of these patients show the enlargement to the left of the heart and the characteristic erosions of the lower borders of the ribs on the left side of the chest. Two other roentgenograms show the stenosed aorta before and after resection of the stenosed section and the anastomosis.

The technique used by these authors consists in an incision starting at the attachment of the cartilage of the third left rib, curving downwards and to the left, with a curve to avoid the breast, and passing posteriorly to the posterior axillary line. In order to gain sufficient exposure of the operative field, ligation of one or two intercostal arteries may be required.

Above and below the stenosed section, firm but not crushing forceps are applied to the aorta; the stenosed portion, together with the contiguous funnel-like portions of the vessel, is resected to a point where the lumina of the two vascular stumps are as nearly as possible of equal caliber. If possible, the reconstructed lumen of the aorta should be as large as that of the aortic arch. The stumps are anastomosed in a manner similar to that used by Blalock, i.e., a continuous mattress suture apposes wide surfaces of the intima. In some instances the anterior wall of the anastomosis was reinforced by a simple continuous suture. In all the authors' patients a direct end-to-end anastomosis could be accomplished.

The vascular clamps are removed with caution; first the lower one is loosened, then the upper clamp is opened briefly several times in order to permit adaptation to lowering of the blood pressure.

The most favorable time for operation is considered

to be between the ages of 10 and 20 years; but it is emphasized that after the age of puberty the hypertension in the arms and upper portions of the body fails to respond, and for this reason it is believed that the operation should be undertaken as early in life as possible. In confirmed instances of upper body hypertension, a number of weeks or months may be required for the blood pressure conditions to approach the normal.

Resection of the stenosis of the aortic isthmus is one of the most brilliant and satisfying accomplishments of the modern developments of surgery. It is a reconstructive procedure, in the best sense of the word, which brings to young patients complete relief from a condition which otherwise would go on to an early death or progressive invalidity.

—John W. Brennan, M.D.

Stage Occlusion and Resection of the Human Aortic Arch with Hypothermia. OWEN GWATHMEY and HOWARD PIERPONT. *Am. Surgeon*, 1955, 21: 827.

THE PRESENT CASE REPORT deals with the excision and reconstruction of the aortic arch. The patient was a male aged 48 years, who complained of recurring episodes of unconsciousness, dizziness, and weakness. He had been treated for syphilis at one time. The carotid artery and radial artery pulsations were barely obtainable, while the femoral pulsations of the lower extremities were normal. Roentgenograms revealed enlargement of the heart, deviation of the trachea to the right with displacement of the esophagus, and a mass in the superior mediastinum indicating the possibility of an aneurysm of the aortic arch.

Under hypothermia a transsternal incision through the third intercostal space exposed the heart and its great vessels. The aneurysm involved the entire aortic arch and the base of the innominate, carotid, and subclavian arteries. The ascending and descending portions of the aorta were normal. A homologous graft was made to shunt blood from the ascending aorta to the innominate artery. The arch of the aorta beyond the base of the aneurysm was then excised and a homologous aortic arch graft was substituted. The redundant innominate, carotid, and subclavian trunks of the graft were excised and the bases were sutured tightly. A third thoracic aorta graft was fitted for anastomosis to the great vessels of the host. With release of the circulation through the new grafts, immediate pulsations were obtained in the great vessels of the neck and in the vessels to the upper extremities. The blood pressure in the upper extremity averaged 80/40 mm. Hg.

The aneurysm measured 12.5 by 10 by 5.5 cm. and contained an organized clot. The aneurysmal wall consisted of connective tissue, calcium, and clots in layers. The pathologic diagnosis was luetic aneurysm of the aortic arch

The postoperative course for the first 12 hours was good. The urinary output in that time was 25 c.c. The patient regained consciousness, was well oriented, and was able to move all of his extremities at will. He was maintained by a slow continuous drip of 5 per cent glucose and water with 30 mgm. of neosynephrin. He died suddenly, but an autopsy was not obtained.

—B. G. P. Shafiroff, M.D.

The Adaptation of Homologous Aortic Grafts for Surgical Correction of Infantile Coarctation of the Aorta; a Preliminary Report. THOMAS G. BAFFES. *Surgery*, 1955, 38: 486.

INFANTILE COARCTATION often cannot be corrected by present surgical procedures. It consists of a relatively long segment of partial obliteration involving the distal aortic arch. It may involve one or both carotids and often involves the left subclavian artery. Sometimes it is associated with septal defects which shunt blood from the left heart to the right heart. Occasionally, a large patent ductus supplies blood to the descending aorta. Local excision of these long segments of infantile coarctation is usually impossible and, in most cases, the condition is not compatible with long life.

Postmortem examination of patients with infantile coarctation revealed that, in many cases, the coarctation did not extend to the base of the heart, but that a dilated segment of aorta was frequently found from the level of the aortic valve to the point of coarctation. This suggested that aortic grafts might be used to connect the ascending aortic arch with the descending thoracic aorta to shunt blood around the segment of coarctation. It was hoped that this principle could be adapted to the precarious surgical risk presented by patients with infantile coarctation by inserting the grafts without attempting to excise the coarctation.

All operative and autopsied cases entering the Children's Memorial Hospital of Chicago since 1940 were reviewed. Only 59 of 105 coarctations seen were amenable to excision and end-to-end anastomosis. Thirteen were infantile coarctations that were, or could have been, corrected by excision and standard replacement with aortic grafts or by utilizing the left subclavian artery to replace the excised aortic segment. Seven were so distorted that surgical relief would have been impossible. Twenty-six had the infantile coarctation limited to the distal two-thirds of the aortic arch. They had large ascending aortas, and aortic grafts could have been used to shunt blood around the coarctation into the descending aorta. In order to ascertain the feasibility of this procedure, a number of animal experiments were performed. These experiments are described in detail and the results listed. A 6 month study on the homologous aortic grafts in the surviving dogs indicated that the grafts are performing well and that the operation is feasible in human beings. *—Robert Paradny, M.D.*

ESOPHAGUS AND MEDIASTINUM

The Management of Corrosive Burns of the Esophagus. JOHN BORRIE. *Austral. N. Zealand J. Surg.*, 1955, 25: 62.

SUCCESSFUL MANAGEMENT of corrosive burns of the esophagus lies in clearly appreciating the progress of the pathological changes from burn to stricture formation. The severity of the burn depends upon the type of agent ingested, its chemical nature and concentration, the amount of agent, and the duration of contact with the tissues. Alkalies, particularly caustic soda and ammonia, are the most common substances taken. Acids produce a coagulation necrosis with action limited to the superficial layers of the esophagus

whereas alkalies produce a liquifying necrosis and penetrate to the deepest layers with an intense inflammatory reaction. The severest burns usually occur in the middle and lower thirds of the esophagus.

There are three distinct phases of a severe burn. The acute phase of local reaction lasts up to 2 weeks, begins with superficial necrosis and mucosal sloughing, and is followed by edema of all of the layers. In severe burns there are associated burns of the lips, mouth, tongue and pharynx; there is dysphagia, retrosternal pain, dehydration, and even acute starvation.

The intermediate phase is characterized by separation of the slough which leaves behind angry red granulations covering a tubular ulcer. This phase of 2 to 4 weeks shows a decrease in the dysphagia and healing by granulation tissue.

In the final phase, the dysphagia again becomes progressive because of fibrosis and stricture formation. When the stricture is finally established, all that is ingested is regurgitated.

When a history is obtained of a patient swallowing a corrosive substance, one should establish whether or not a burn actually exists, its severity, and to which stage it has progressed. Esophagoscopy is the only method by which this can be determined accurately and should not be delayed in the absence of an obvious oral burn. Fluoroscopy should be reserved for use at a later date to determine the site and nature of any subsequent stricture formation.

Immediate management consists of neutralization of the chemical agent, alleviation of the symptoms, maintenance of nutrition, chemotherapy for infection, and an attempt to counteract probable stricture formation. The latter is accomplished by attempting to limit granulation tissue formation with intensive chemotherapy and ACTH. It is more important, however, to preserve the esophageal lumen with daily bouginage or a 40 French stomach tube, which acts as both a food passage and an internal splint during the stage of cicatrization.

The established stricture is managed by dilatation if feasible or surgical intervention to restore continuity. Surgical treatment is indicated if the stricture does not respond to conservative measures, if it continues to recur with increasing frequency despite repeated dilatation, or when it is economically unsound for young patients with domestic responsibilities to be repeatedly attending hospital. A stricture less than 3 cm. in length can be managed by resection and end-to-end anastomosis. In longer lesions, the author favors esophagogastrostomy without excision of the stricture.

—James H. Holman, M.D.

Primary Melanocarcinoma of the Esophagus. ALFRED A. POMERANZ and JOHN H. GARLOCK. *Ann. Surg.*, 1955, 142: 296.

PRIMARY VISCERAL MELANOMA is an exceedingly rare tumor. Eleven instances of this tumor have been reported since the original report of Bauer in 1906. The demonstration of junctional changes in the overlying or juxtaposed epithelium is a prerequisite to the diagnosis of primary melanoma. The absence of these changes indicates that the melanoma is metastatic at that site.

A case report, the fifth well documented one, is included in the article. The patient was living and well a year after radical esophagogastrectomy. The primary melanocarcinoma was at the junction of the middle and lower thirds of the esophagus; junctional changes were demonstrated in the specimen.

The controversy concerning the origin of melanomas in general and in the esophagus specifically is discussed. The author concludes that melanomas arise only from melanoblasts (the dendritic cells) and that these cells are ectopically located in the esophagus in those individuals who develop melanocarcinoma of the esophagus. *—Jerry A. Stirman, M.D.*

Malignant Neoplasms of the Connective Tissues: Fibrosarcoma of the Mediastinum (In tema di neoplasie maligne connettivali: il fibrosarcoma del mediastino). GIAN FEDERICO MONTI. *Arch. ital. chir.*, 1955, 79: 337.

A REVIEW of the literature concerning the histologic features and classification of mediastinal fibrosarcomas, and the report of a case are presented.

In recent years there has been a trend to classify sarcomas more accurately, on the basis of their histologic features. Rather than classifying them according to the predominant cell type, they are identified on the basis of histologic structure, i.e., whether they arise from the reticuloendothelial system, fibrous tissue, muscle tissue, or adipose tissues. In this latter classification, sarcomas are usually identified as reticuloendotheliomas, liposarcomas, rhabdomyomas or fibrosarcomas. An index of the malignant behavior of these tumors can be predicted by the predominance of cellular elements in ratio to the stroma.

The case report is that of a 23-year-old male who had a 6 months' history of nonproductive cough, associated with episodes of dyspnea and pain in the right hemithorax. Clinical examination revealed an area of dullness to percussion, extending 4 cm. to the right of the mediastinum and accompanied by Horner's syndrome on the right and evidence of venous hypertension affecting the right upper extremity.

A roentgenogram of the chest revealed a large oval mass projecting from the superior third of the mediastinum, having a uniform density with clear peripheral lung markings. A thoracotomy was done with resection of the right fourth rib, and on retraction of the lung the mass was identified as projecting from the mediastinum, covered by the pleura, and having prominent vascular markings. The tumor mass was easily separated from the surrounding lung tissue, but could not be removed intact from the mediastinum because of profuse bleeding. The resected tumor mass measured 11 by 8 by 6 cm. The patient had an uneventful postoperative course.

The microscopic pathology of this tumor presents a rather uniform pattern. It was highly cellular and the cells had a tendency to group into fascicles formed by the elongated cytoplasm. Nuclei were large and vesicular with frequent atypical mitotic figures. The stroma revealed numerous endothelial vascular markings. The histologic diagnosis was that of fibrosarcoma and the patient was given four cycles of roentgen therapy, receiving 3,000 roentgens per cycle. The patient remained well until approximately 3 years later

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when he had a recurrence of the previous symptomatology and a rapid downhill course over a 6 months' period. He expired from a recurrence of mediastinal fibrosarcoma.

The superior portion of the mediastinum is the site of most frequent localization of this lesion in the chest. The author supports the theory that these lesions may be due to embryonic rests in the form of hemartomas which may have undergone malignant degeneration. —*Roland A. Manfredi, M.D.*

MISCELLANEOUS

The Operative Treatment of Congenital Diaphragmatic Hernia with Special Consideration of Hiatus Hernia (Zur operativen Behandlung der kongenitalen Zwerchfellhernie mit einem Beitrag zur Hiatushernie). W. WEIDENMANN. *Chirurg*, 1955, 26: 399.

ACCORDING to the general consensus of opinion, early operation is the method of choice in the treatment of congenital diaphragmatic hernias. A complete cure may be expected in from 90 to 95 per cent of the patients so treated.

Congenital diaphragmatic hernias may be considered as inhibitory malformations originating during the second or third embryonal month. The author advocates their classification on the basis of pathologoanatomic findings. In the great majority of cases the hernia is located in the left posterolateral region.

Unlike acquired hernias, adhesions between the chest organs and the parietal pleura are present only rarely in patients with congenital hernias. In approximately 90 per cent of posterolateral ruptures, no hernial sac is present, and the affected half of the thorax is filled with intestinal loops. In contradistinction to the posterolateral type, the hiatus hernia always possesses a sac containing, chiefly, the stomach.

Two types of hiatus hernia may be distinguished—those with a normal esophagus and those in which this organ is abnormally short. The author reports one case of the last mentioned type.

So-called retrosternal hernias contain small portions of the liver and the stomach or a short segment of intestines.

Cyanosis, dyspnea, or vomiting in a newborn infant should always arouse the suspicion of a diaphragmatic hernia. A marked anemia frequently accompanies this condition. Hematemesis, accelerated respiration, frequency of pulse, and the results of percussion and auscultation focus the attention on a hiatus hernia, and the radiologic examination furnishes the final proof. Administration of barium is not without danger and is superfluous in the majority of cases.

With the exception of small, asymptomatic hiatus hernias, operation should be performed as soon as the diagnosis has been made. Surgical procedures are better tolerated on the first and second postnatal days than between the seventh and tenth days. Moreover, the intestines are less filled the first two days and therefore reduction of the hernia is easier to accomplish. The author recommends the use of an oxygen tent before the operation, intubation, and the transabdominal approach; in older children and in adults the transthoracic route is the method of choice.

—*Joseph K. Narat, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Right Inguinal Hernia As A Result Of Appendectomy (A proposito dell'ernia inguinale destra quale conseguenza dell'appendicectomia). S. TARTARO and G. B. BIFULCO. *Riforma med.*, 1955, 69: 1013.

THE AUTHORS have attempted a critical review of the incidence of inguinal hernia on the right side following appendectomy. This sequence of events has been reported to occur in from 4 to 12 per cent of appendectomies.

The theories to explain such a complication may be listed as follows: (1) postoperative ileus and distention, (2) local adhesions and inflammatory reaction, (3) local neuromuscular damage, and (4) failure to reconstruct the transversalis fascia properly.

In an unselected series of 500 appendectomies the authors found that 10.2 per cent of the patients developed inguinal hernia. In another series of 178 appendectomies followed up from 1 to 7 years 11 per cent of the patients developed inguinal hernias on the right side and 6.7 per cent developed them on the left side.

As a result of their experience the authors believe that appendectomy contributes to the development of inguinal hernia on the right side probably because of faulty reconstruction of the transversalis fascia.

—George L. Nardi, M.D.

Spigelian Hernia. JOSEPH A. IGNATIUS. *Am. J. Surg.*, 1955, 90: 388.

THE SPIGELIAN, or semilunar, line is a descriptive term denoting the transition of the transversus abdominis muscle into its aponeurosis, which usually occurs slightly lateral to the lateral margin of the rectus abdominis. A spigelian hernia can occur at any point along this line from the costal margin to the pubic spine, but most of them occur inferior to the umbilicus, just lateral to the rectus, at the junction of the semilunar line with the semicircular fold of Douglas (the caudal termination of the posterior rectus sheath) which may be at any level from the umbilicus to the pubic crest.

The etiology, as with other hernias, is unknown, but the several theories are briefly reviewed.

The symptoms and physical findings are not essentially different from other hernias, but, if the sac is small or the patient obese, the hernia may be obscured or palpated with difficulty.

The treatment is surgical, with excision of the sac and repair of the facial defect as the primary objectives. Two case reports are included.

—David T. Petty, M.D.

Ilioinguinal Block Dissection with Primary Healing. E. STANLEY LEE. *Lancet*, Lond., 1955, 2: 520.

FOLLOWING the procedure of radical inguinal node dissection, the complications of skin necrosis, lymph fistula, delayed healing, and lymphedema are common. Many of these difficulties arise from the necessity for thinly dissected flaps on the femoral side of the wound and "tenting" of the skin over the hollow groin. To prevent them a new incision and technique has been used in 11 patients, with primary healing in most instances. The technique involves complete excision of the devitalized femoral skin flaps and coverage of the resultant defect with a mobilized abdominal flap.

The incision is in the shape of a large "C", starts at or near the umbilicus, curves laterally toward the flank, downward across the anterior superior iliac spine to below the inguinal ligament, and back up to the pubic tubercle. From the inguinal part of the incision, a short vertical incision is made extending downward over the femoral vessels. Thin skin flaps are developed on each side of this incision and the femoral lymph nodes, fat, and upper portion of the long saphenous vein are removed from below upward to the inguinal ligament. The abdominal flap is then mobilized from the lateral side toward the base near the midline, exposing the abdominal muscles as far medially as the anterior perforating branches of the epigastric arcade. These branches carry the blood supply to the flap. If iliac dissection is desired, the external oblique aponeurosis is split to expose the inguinal canal, and the underlying internal oblique and transversus muscles are divided. Transversalis fascia is opened and the peritoneum elevated from the iliac vessels to the desired level—at least to the common iliac bifurcation. Fatty tissue is then stripped from the vessels from above downward to the inguinal ligament. Closure is anatomical until the skin is reached. Femoral skin of questionable viability is excised and the abdominal flap is shifted downward to cover the defect. One or two "pin-down" sutures hold the flap against the external oblique aponeurosis. A split-thickness graft at the upper part of the incision has not been necessary in any cases to date. No drain is used. A snug pressure dressing is applied and left undisturbed for 10 days. Penicillin and streptomycin are given postoperatively as a routine measure.

If previous abdominal incisions would appear to jeopardize the base of the flap, the incision may be placed so the base is lateral and the free edge is at the midline.

—Stanley W. Tuell, M.D.

GASTROINTESTINAL TRACT

Esophageal Dyskinesia in the Pathogenesis of Hiatal Gastric Hernia (Discinesie esofagee nella patogenesi delle ernie gastriche iatali). G. MARCOZZI, G. DEL GRANDE, and G. A. RICCI. *Ann. ital. chir.*, 1955, 32: 473.

THE AUTHORS review the subject of hiatal hernia. Little importance has been given to the presence of functional disturbances of the esophagus as one of the causes.

Eleven cases of hiatal hernia are presented. Three of these showed an accompanying diverticulum of the esophagus, in 1 case there was a tumor of the esopha-

gus, in 1 a stenosis, in 3 cases cardiac hypertrophy, in 1 case aortitis, and in 1 case esophageal varices.

These pathologic entities act as an irritative focus, producing esophageal dyskinesia with segmental or diffuse spasms, and the formation of a short esophagus with hiatal gastric hernia. The dyskinesia produced by the vagosympathetic imbalance causes a contraction of the longitudinal fibers of the esophagus, thereby producing a temporary or permanent short esophagus and hiatal gastric hernia.

The article is accompanied by 22 roentgenograms.

—*Lucian J. Fronduti, M.D.*

Tuberculosis of the Stomach (La tuberculose gastrique). J. SÉROR. *J. chir.*, Par., 1955, 71: 549.

GASTRIC TUBERCULOSIS is more common than is generally thought. There are no typical signs or symptoms. Usually the diagnosis cannot be made except at surgery and even then there may be doubt. There are two criteria for the diagnosis of gastric tuberculosis: (1) the presence of tubercle bacilli demonstrable microscopically in the tissues, and (2) the presence of a granuloma in the gastric wall histopathologically typical of tuberculosis. Tubercle bacilli in gastric washings are not significant except in patients with dyspeptic symptoms and negative chest findings.

There are four types of gastric tuberculosis: (1) ulcerative, (2) hypertrophic, (3) inflammatory, which resembles linitis plastica, and (4) cold abscess of the stomach.

The pathologic process begins in the lymphatic tissue in the gastric wall.

Surgery (gastric resection) is the treatment of choice for gastric tuberculosis. Antibiotics are important and should be used before and after operation. A long postoperative period of follow up during which antibiotics are administered is necessary.

Three case reports are presented in detail.

—*Frederick W. Preston, M.D.*

Treatment of Acute Hemorrhage in Peptic Ulcer (Sul trattamento delle emorragie acute da ulcera peptica). ANGELO MEDICI. *L'ateneo parmense*, 1955, 26: 7.

THE AUTHOR reviews the treatment of acute hemorrhage as given at the University of Parma, Italy. Among 297 patients with peptic ulcer there were 25 with acute hemorrhage seen in a 3.5 year period from 1951 to 1955. They presented 10 gastric ulcers, 12 duodenal ulcers, and 3 anastomotic ulcers.

Only 2 patients had emergency surgery for uncontrollable hemorrhage. The remainder were treated conservatively with good results, which allowed surgery to be performed as an elective procedure at a later date. One of the medically treated patients died 8 hours after admission. He was 72 years of age and rapidly became worse after admission. At autopsy he was found to have a juxtapyloric ulcer. In addition, he was found to have carcinoma of the rectum and a cardiac aneurysm due to a myocardial infarct. One of the patients who had an elective operation 7 days later died from postoperative obstruction, and therefore the death was not related to the hemorrhage.

The author believes that emergency surgery should be used only in those rare cases in which the hemorrhage does not rapidly cease or in which there is a recurrence of hemorrhage in a short period of time. He suggests the possibility of using hypothermia for uncontrollable hemorrhage. By preserving the vital organs against the damages of hypotension and anemia spontaneous hemostasis of the bleeding point would be better induced by the hypotension itself.

The authors used this form of treatment in a patient who developed an uncontrollable hemorrhage 3 hours after gastric resection for a marginal ulcer. A second operation was not advisable. Hypothermia was resorted to and continued for 10 hours at 30 to 31 degrees Centigrade. The patient made a good recovery.

—*Lucian J. Fronduti, M.D.*

Remote Results of Gastrectomy for Gastric or Duodenal Ulcer (Résultats lointains de la gastrectomie pour ulcère gastrique et duodénal). H. WELTI, G. MONDET, and S. SCHNEIDER. *Presse méd.*, 1955, 63: 1089.

STRICT INDICATIONS and meticulous technique are the keys to successful gastrectomy. The authors base their conclusions on the review of 171 operations performed by one of them, always using identical technique.

Of 74 gastric ulcers, 50 were located on the lesser curvature, 22 in the pyloric region, and 2 on the greater curvature. Of 97 duodenal ulcers 79 were excised. In nearly all cases the Polya operation was performed, with a short jejunal loop, but in 5 instances antecolic anastomosis with a long loop was employed. Three layers of sutures were used because a separate approximation of the muscular layers facilitates the formation of a new sphincter. The stomach was sectioned not perpendicular to its long axis but in an oblique direction, in such a manner that the anastomosis assumed a vertical position and thus prevented reflux from the afferent loop and facilitated evacuation into the efferent loop. One should not hesitate to enlarge a stoma which appears too small or to untie an improperly placed suture.

The operative mortality in the authors' series was 1.7 per cent (2 patients). Follow up studies could be done in only 70 per cent of the remaining 169 patients. Excellent results were recorded in 92 patients, mediocre in 16, and poor in 10. This conclusion was based on clinical, roentgenologic, and hematologic findings.

The patients in the first group were engaged in their preoperative occupation and used no discrimination in regard to the selection or quantity of their foodstuffs. Their digestion was not accompanied by malaise, and none had lost weight or showed signs of anemia. Perfect function of the stoma could be demonstrated roentgenologically.

The patients with mediocre results were forced to restrict their normal activity but felt better than before the operation. Some patients complained of the dumping syndrome, others had signs of jejunitis, malfunction of the anastomosis, adhesions, or hepatobiliary disorders. No anemia could be detected in this group.

In the group with poor results marginal ulcers or the dumping syndrome was observed. In 30 per cent of the patients a second operation was followed by great amelioration or complete disappearance of the

symptoms. The authors conclude that excellent results were obtained in 78 per cent of the entire series, mediocre in 14 per cent, and poor in 8 per cent.

—*Joseph K. Narat, M.D.*

The Technique of Gastric Resection in Cancer of the Gastric Antrum or of the Pylorus (Text in Russian). A. S. LURYE. *Vestn. Chirurg.*, 1955, 75: 14.

SAPOSHKA, in his description of his method of total supracardial extirpation of the stomach for cancer of the lesser curvature, recognized the fallacy of such a radical procedure when the neoplasm is situated low down on the gastric antrum or in the pylorus. For total extirpation in these cases the incision is placed far from the limits of any possible histologically demonstrable infiltration of the gastric wall by the cancer cells. For these lowly placed types of carcinoma the author attempts to preserve the cardia and as much of the fundus of the stomach as the nature of the neoplastic involvement permits.

In the subtotal gastrectomy now employed on the author's service, emphasis is placed rather on the complete extirpation of all lymph gland chains which might act as reservoirs for the lodgment of metastatic cancer cells. Thus, particular attention is given to the region of the hepatopancreatic ligament, that is, to the retroperitoneal glands behind the pancreas along the course of the hepatic artery and its branches. The removal of these glands necessitates, of course, manipulations in the neighborhood of the hepatoduodenal ligament and the pancreatic gland with attendant menace to the portal vein and the hepatic and splenic arteries.

All the lymph glands in the gastrocolic ligament, in the retroperitoneum behind and above the pancreas, and in the lesser omentum as high as the transverse porta hepatis vertically, and from the hepatoduodenal ligament on the right to the region of the gastric cardia on the left in the transverse direction are removed en bloc, together with the epiploon and a portion of the stomach and duodenum. In fact, the cardial and fundal gastric stump is lifted forward and the lymph gland tissues behind this structure are removed as far to the left as the splenic porta.

In determining the portion of the gastric fundus and cardia which is to be preserved, particular attention must be given to the possible presence of an anomalous branch of the left gastric artery passing to the liver. This branch, when of large caliber, may supplement (or actually replace) the left branch of the hepatic artery which supplies the left lobe of the liver. If this anomalous branch is encountered, it must, of course, be preserved. The left gastric artery must be exposed along its course and ligated distal to the point of emergence of this anomalous vessel.

Since 1948, 388 gastric resections have been done for gastric cancer. All of these were done in the author's surgical service. Of this total number, 276 were of the subtotal variety here discussed, and of these 276 partial gastrectomies, 101 (36.6%) were of the complicated type, that is, the type in which parts of the mesocolon (or of the colon itself), or parts of the liver, were also removed. In 86 of these 276 subtotal gastrectomies the final results could be ascertained. It was found by Kirpichnikov that, despite the fact that many of the patients were in a late phase (stage 3) of their neoplastic malady, 36 were still living without evidence of recurrence or metastasis 3 years or more after the resection operation. Among this number were patients who presented histologic evidence of metastasis to the lymph glands in the removed specimen.

During this same period 26 of the patients who were operated upon by the previous methods, that is, the "usual" resection without removal of the lymphatic nodules which are located along the course of the left gastric and the hepatic arteries, were still alive after 3 years or more. The majority of these resections were not of the subtotal variety.

Thus, although the number of patients followed-up is relatively small, it is seen that with the operative method including removal of the described lymphatic chains (the majority were complicated resections) the ultimate results were 25 per cent better.

The present article has to do only with the problem of lymphatic metastasis and its treatment; it does not deal with the problem of hematogenic or peritoneal metastases which are not susceptible at present to any form of surgery.

—*John W. Brennan, M.D.*

Intestinal Infarct (Sull'infarto intestinale). GIUSEPPE ZANNINI. *Gior. ital. chir.*, 1955, 11: 833.

THE AUTHOR reports on 2 patients with an intestinal infarct, a 58 year old engineer and a 61 year old general. Both were operated upon and the former survived, while the latter died a short time after the operation. About 3 hours after the operation he developed severe pain in both lower extremities with loss of femoral pulsation. He was considered to have had a second thromboembolic accident at the aortic bifurcation. A clinical diagnosis of internal hernia in the first case, and probable intestinal infarct in the second, had been made before operation. The infarct in the first case involved the arterial system, while in the second case the venous system was primarily involved.

The author believes that all patients should be operated upon with ample resection of the involved bowel. The only contraindication is profound shock not responding to the usual supportive measures.

—*Lucian J. Fronduti, M.D.*

Acute Intestinal Obstruction; Considerations with Reference to 135 Cases (Obstruções intestinais agudas. considerações em tôrno de 135 casos do H. S. E.). SILVIO LEVY and WALTER GENTILE DE MELLO. *Rev. brasil. cirurg.*, 1955, 29: 371.

A STATISTICAL STUDY of 135 cases of acute intestinal obstruction from the proctologic clinic of the hospital for government employees (Hospital dos Servidores do Estado), Rio de Janeiro, Brasil, is presented. The authors admit that the present study is not too comprehensive, but without considering certain statistical conclusions which are already well known, they believe that they can present aspects which are important and which have not previously been noted.

Perhaps the most outstanding aspect is that the general percentage of mortality is unusually low (17.21 per cent of 122 cases). The authors believe that this mortality figure speaks well for the organization and equipment of their hospital.

A second important aspect is that the figures pertaining to the results obtained in the series with surgical intervention are much more favorable than those obtained in a series of cases in which more conservative measures were used. The mortality in patients not operated upon reached 21.24 per cent; the mortality among patients who were operatively treated was only 12.50 per cent. When the material was broken down into categories the differences were even more striking; in cases of mechanical obstruction of the small intestine, accompanied by strangulation, the mortality among patients not operated upon was 50 per cent; the corresponding figure for patients operated upon was 4.16 per cent; for the adynamic obstructions (due to nervous imbalance) the respective figures were 34.60 per cent for patients treated conservatively and 12.50 per cent for surgically treated patients. Only in the group of cases of mechanical obstruction without strangulation were the figures favorable for conservatism (a mortality of 9.09 per cent for conservatively treated patients and 12.50 per cent for surgically treated patients).

On the whole the authors believe that their experience justifies emphasis upon surgical intervention for the treatment of acute intestinal obstruction.

—*John W. Brennan, M.D.*

The Organic Obstruction of the Small Intestines in Nurslings and in Early Infancy (Les occlusions organiques de l'intestin grêle chez le nourrisson et dans la première enfance). M. J. LASSERRE. *J. méd. Bordeaux*, 1955, 132: 745.

INTESTINAL OBSTRUCTION in nurslings and infants can be classified as follows:

A. Obstruction caused by intrinsic factors:
  I. Occlusion:
    1. Helminthic infestation, especially a conglomeration of Ascaris lumbricoides, which not only may be responsible for intestinal obstruction but also may contribute to the development of intussusception or volvulus.
    2. Alimentary bolus, such as a rapidly swallowed lump of cereal.
  II. Intussusception: ileocecal or the less frequent ileoileac type.

B. Obstruction caused by extrinsic factors:
  I. Late postoperative obstruction by adhesions and bands, the latter formed chiefly by omentum.
  II. Early postoperative obstruction, produced by the agglutination of intestinal loops. Such a condition may develop following a secondary operation for stenosis of the small intestines after appendectomy, reduction of intussusception, or closure of an intestinal fistula resulting from peritonitis caused by appendicitis.
  III. Obstruction created by adhesive peritonitis which in turn is usually the sequel of acute appendicitis or inflammatory mesenteric lymphadenopathy.
  IV. Obstruction due to various congenital malformations, such as adherent Meckel's diverticulum or abnormal membranes.

The signs and symptoms of obstruction of the small intestines in nurslings and children younger than 5 years are practically the same as in adults. Bilious, and later on, fecal vomiting proves that one is dealing with intestinal obstruction and not a simple indigestion. Dehydration caused by repeated vomiting and intestinal stasis is responsible for reduced tension of the eyeballs, dryness of the tongue, the depressed fontanelles, and loss of the normal turgor of the skin.

Three clinical forms of ileoileac intussusception may be distinguished: (1) there is initial pain which may lead to convulsions and is followed by the progressive development of occlusive phenomena; rectal bleeding appears after 2 or 3 days, or remains absent; (2) 1 or 2 days after the painful onset another crisis appears, and the pain is accompanied by profuse rectal hemorrhage; and (3) pains are hardly noticeable, the vomiting and suppression of defecation being the only alarming symptoms.

As a rule, the intussusceptum is palpable only located in the ileocecal region.

The author stresses the diagnostic importance of a scout film, while in his opinion a barium enema is of minor significance except in ileocecal intussusception, in which condition it may be not only of diagnostic but also of therapeutic value.

The diagnosis should consider secondary or reflex paralytic ileus following neurotoxicosis of nurslings because this type of ileus is amenable to conservative treatment. In such instances the scout film reveals a very limited number of gas bubbles which are far from one another and are scattered both throughout the small and large intestines. In older children similar conditions may represent complications of infectious encephalopathies, acute meningitis, grave osteomyelitis, or extensive burns. The stomach in these patients may participate in the distention, the vomited fluid never has a fecal aspect, and borborygmi are audible.

The author recommends the open method of anesthesia, with ether and oxygen. He emphasizes the importance of a thorough evacuation of intestinal fluids through one or, if necessary, several punctures and aspiration. This maneuver prevents the shock produced by forced replacement of distended intestinal loops into the peritoneal cavity. Furthermore, it stops absorption of toxic material by segments of intestines adjacent to the lesion. Finally, decompression facilitates the re-establishment of peristalsis.

Noble's plication does not always prevent recurrence of obstruction. Ileotransversostomy should be employed only in exceptional cases. Nylon is used for suturing the abdominal wall.

—*Joseph K. Narat, M.D.*

Primary Carcinoma of the Duodenum; A Report of 15 Cases. ROBERT L. BRENNER and CHARLES H. BROWN. *Gastroenterology*, 1955, 29: 189.

THE AUTHORS report 15 cases of primary carcinoma of the duodenum. They do not include ampullary lesions. In 3 cases the lesions were suprapapillary (one in the duodenal bulb), in 5 peripapillary, and in 7 infrapapillary.

The 15 patients presented 5 major syndromes, either singly or in various combinations:

1. Obstruction, manifested by epigastric fullness, dilatation of the stomach, vomiting, visible peristalsis, and dehydration.

2. Ulcerlike symptoms consisting of epigastric pain coming on 2 to 4 hours after eating, dull or burning in character, and relieved by alkalies. Five of the patients presented such symptoms; however, in no case were the symptoms considered typical of ulcer—they were continuous and became progressively more severe.

3. Acute or chronic blood loss was present in 8 cases (tarry stools and weakness in 7 cases, massive hematemesis in 1 case).

4. Biliary obstruction was present and jaundice was seen in 4 patients some time during the course of the disease. The condition may be intermittent, due to sloughing of necrotic tissue, or it may be progressive.

5. Loss of weight was noted in 12 of the patients (average 32 pounds).

Gastric retention, anemia, evidence of biliary obstruction, and blood in the stools are suggestive laboratory findings. The finding of complete absence of bile and the presence of gross blood on duodenal intubation should suggest an ampullary or periampullary lesion. Cytologic examination of duodenal contents for tumor cells should be carried out.

Roentgenologic examination is the one most important diagnostic medium. The differential diagnosis includes duodenal ulcer with obstruction, benign tumors such as adenomas and myomas, duodenal diverticulum, pressure of an enlarged gallbladder, and other conditions.

Three gross forms are seen—scirrhous, polypoid, and colloid. Metastases are found in the regional lymph nodes and in the liver, chiefly, and direct extension may occur into the omentum, mesentery, and adjacent organs.

The longest survival after palliative surgery was 24 months and after radical surgery, 30 months.

The authors conclude that despite the discouraging results of radical surgery, such surgery is the only means at the present time of offering a possible cure to the patient with carcinoma of the duodenum.

—Robert Paradny, M.D.

An Appraisal of Radical Pancreatoduodenectomy in the Treatment of Malignant Disease; a Collective Review of Recent American Literature. Y. K. J. GRÖNQVIST. *Ann. chir. gyn. fenn.*, 1955, 44: 120.

THE PURPOSE of the present report is to attempt to appraise the value of radical pancreatoduodenectomy as a cancer operation.

Anatomic considerations. The variations in size and shape of the head of the pancreas and its relationship to the superior mesenteric artery and portal vein make resection of the head a hazardous undertaking. In addition, lymph channels from the head of the pancreas run to nodes along the borders of the pancreas, into the mesenteric nodes and nodes about the celiac axis, superior mesenteric vessels, and the aorta. They also run to nodes about the pylorus and portal vein. This close proximity of the head of the pancreas to major blood vessels and the multiple lymph drainage about the major vessels makes an adequate cancer operation difficult.

Pathology. Malignant tumors of the pancreatoduodenal area constitute 1 to 2 per cent of all malignant tumors. Carcinoma of the head of the pancreas accounts for 73 per cent of the malignant tumors in this area, carcinoma of the ampulla of Vater for 16 per cent, carcinoma of the common bile duct for 8 per cent, and carcinoma of the descending portion of the duodenum for 3 per cent. Metastases to the regional lymph nodes were present in 60 per cent of cases of carcinoma of the head of the pancreas, and in 30 per cent of cases of carcinoma of the ampulla of Vater. The perineural lymphatics were invaded in 66 per cent of cases with carcinoma of the head of the pancreas. Carcinoma of the head of the pancreas was found to be impinging on vessels of the portal area in 37 per cent of the cases while this phenomena was observed in only 6.6 per cent of cases of carcinoma of the ampulla.

Operability and resectability rates. Accurate analysis is difficult because of the difficulty of diagnosis in patients not operated upon, and because poor results have led to a decline in the number of operations. McDermott and Bartlett reported on 183 cases in which exploration was carried out in 22 per cent, but operation was not performed; 43 per cent of the patients had some type of palliative resection, and 35 per cent were subjected to radical pancreatoduodenectomy. Carcinoma of the ampulla carries a much greater resectability rate.

The mortality rate varies but an analysis of several reports gives an overall rate of 22 per cent. Actually, in large centers, the mortality rate has decreased in recent years and Waugh states that it should not exceed 10 per cent.

Postoperative morbidity. Most studies seem to indicate that if the remaining pancreatic duct is anastomosed into the intestine so that pancreatic secretion joins the gastrointestinal tract, the majority of resected patients are able to maintain their weight and nutrition. The addition of pancreatin to the diet appears to be useful.

Lack of adequate internal secretion of the pancreas appears to be only a minor problem. Miller reports 2 of 47 cases in which mild diabetes mellitus developed. All of the patients studied following resection, even though they eventually died of metastasis, led a comparatively normal life in the interim.

Follow-up results. The five-year survival rate for patients undergoing resection of the head of the pancreas is very poor. Of 237 cases reported in five different series, there were only 7 five-year survivors, or 2.9 per cent. Carcinoma of the ampulla of Vater gives a somewhat better five-year survival rate, being about 24 per cent. *—John H. Davis, M.D.*

Ileostomy—Management and Complications. ALBERT S. LYONS. *Surg. Clin. N. America*, 1955, 35: 1411.

THE PRINCIPLES and details of ileostomy care are summarized on the basis of a 15 year experience with 150 patients. The preoperative management includes preparation of the patient to accept the procedure, as well as careful planning to place the stoma in the optimum location on the abdomen. In the operating room, a temporary plastic appliance is cemented around the ileostomy, later to be replaced by a more

substantial bag by the time the patient leaves the hospital. There is no one bag suitable for every patient. The special characteristics, methods of fit, and care of the principal types of appliances should therefore be learned. These include the cement-on flat discs (detachable cuff, nondetachable cuff, detachable pouch), and the noncemented discs (soft rubber, firm plastic, firm rubber).

Skin excoriation when established requires special techniques to provide protection and yet to permit containment of the ileal discharges. Some of the principal complications of ileostomy seem to be avoidable; these are skin separation, ileostomy dysfunction, prolapse, and fistula. Other complications apparently have unknown origins: minor and major obstruction, retraction, and small bowel enteritis. Some of these demand specific operative correction. Psychological support and technical education of the patient may be particularly achieved with the aid of an ileostomy club. Individual difficulties, however, require the devoted attention of the surgeon.

—*Robert Turell, M.D.*

Primary Acute Inflammation and Primary Idiopathic Infarction of the Great Omentum. THOMAS F. ROSE. *Med. J. Australia*, 1955, 2: 278.

CASES OF PRIMARY ACUTE INFLAMMATION and of primary idiopathic infarction of the great omentum are reported. The etiology of these two conditions is unknown and the conditions should not be confused with inflammation or infarction secondary to known causes.

Clinically, it is impossible to differentiate between primary acute inflammation of the omentum and idiopathic infarction. In the latter there is superimposed inflammation of the surrounding omentum so that the clinical result is the same. In both lesions there is usually a long history of raised temperature with abdominal pain and tenderness. In most instances a palpable abdominal mass develops.

At operation a localized omental tumor separated from the bowel by a strip of normal omentum is found. In later cases of infarction the infarct may be completely separated and lying free in an omental cavity. Since the clinical pictures and the macroscopic appearances of these lesions are similar, differentiation of the two conditions often depends upon pathological study.

The treatment in both types of cases is merely excision of the affected area.—*John L. Lindquist, M.D.*

Modern Treatment of Sigmoid Diverticulitis by Primary Radical Excision (A proposito del trattamento moderno radicale per prima delle diverticoliti del sigma). LUCIANO PROVENZALE. *Policlinico, sez. chir.*, 1955, 62: 189.

THE AUTHOR reviews the subject of diverticulitis and presents 4 cases in which primary surgical excision produced good results. Diverticulitis is considered to be more frequent than local statistics would indicate. Medical management is only temporary and does not prevent complications. The surgical management of complicated diverticulitis has been prolonged and dangerous. Palliative measures have given inconstant and transitory results.

Radical surgical excision of the affected portion offers lasting results in a high percentage of cases. Modern management with the use of antibiotics, proper preparation of the patient, and progressive improvement in surgery of the colon have reduced the risk of excision of the sigmoid colon and have rendered possible primary resection of the bowel without preceding or associated colostomy.

An increase in the frequency of surgical intervention for sigmoid diverticulitis before complications arise is recommended by the author. This would also serve to eliminate the consequences of mistaking cancer for diverticulitis. —*Lucian J. Fronduti, M.D.*

The Surgical Treatment of Ulcerative Colitis. ORVILLE F. GRIMES, PETER BOUDOURES, JACKSON T. CRANE, and LEON GOLDMAN. *Am. J. Surg.*, 1955, 90: 228.

THE GENERAL characteristics of ulcerative colitis as observed in 255 patients seen at the University of California Hospital from 1937 to 1955 are discussed, with particular emphasis being given to the small percentage of this group who required surgical treatment.

Ulcerative colitis, the etiology of which remains obscure, is usually a chronic disease, characterized by exacerbations and remissions of varying severity. Most patients are adequately managed on a medical program. However, surgical treatment is definitely indicated when exacerbations of increasing severity and acute complications occur despite medical therapy, or when the ulcerative process has so altered the bowel wall that normal function is no longer possible. As a rule, from 15 to 25 per cent of patients with this disease (21.5 per cent in this series) will fall into this category.

Of those patients who require surgical treatment, a certain percentage may respond satisfactorily to ileostomy alone. However, this procedure does not cure the disease nor remove the diseased bowel in which polyps and carcinoma may subsequently develop. For this reason, ileostomy is now generally regarded as a preliminary rather than a definitive procedure.

In recent years, the trend has been to combine ileostomy with partial removal of the colon as far down as the sigmoid, as the first step of the operative program. While some have advocated one-stage total removal of the colon and rectum, it is the experience of the authors that the number of patients whose condition will permit an initial procedure of this magnitude without excessive morbidity and mortality is extremely limited. Following the first stage of the operative procedure, it has usually been the policy of the authors in cases of less acute rectal involvement to have the patient return for systematic observation before proceeding with rectal excision. In most cases in the series, however, removal of the rectal segment was subsequently necessary.

The use of antibiotics and an increasing awareness of the importance of instituting surgical treatment in intractable cases while the patient is still in good preoperative condition have contributed greatly to the marked decrease in mortality associated with operative therapy in this disease in recent years. Despite fre-

quent postoperative complications, it can be said that surgical treatment followed by an intelligent adjustment to an ileostomy has much to offer the patient afflicted with acute manifestations of this disease.

The Clinical Evaluation of 750 Patients with Colon Cancer; Diagnostic Survey and Follow-Up Covering a 15 Year Period. THOMAS A. SHALLOW, FREDERICK B. WAGNER, JR., and ROBERT E. COLCHER. *Ann. Surg.*, 1955, 142: 164.

THE AUTHORS present an analysis of 750 consecutive cases of cancer of the colon, rectum, and anus in patients treated during the last 15 years at the Jefferson Medical Center.

The peak incidence occurred in the sixth and seventh decades, with slight male predominance. Change of bowel habit was a predominant and an early symptom. The classical distinction between cancers of the right (weight loss, mass, anemia) and left (obstructive phenomena) colon was borne out in this series. The triad of mass, bleeding, and tenesmus was characteristic for rectal cancers.

Positive diagnosis was made by barium enema, sigmoidoscopic biopsy, and digital rectal examination. A high percentage of delay in diagnosis was usually caused by the assumption by patient or doctor that rectal bleeding was due to hemorrhoids. Half the cancers in this group were palpable on digital rectal examination. Seventy-seven per cent of the lesions occurred in the lower sigmoid, rectosigmoid, and rectum. Colonic polyps were a coincidental finding in 16.2 per cent of the patients, and another primary cancer in 4 per cent.

Cardiovascular disease was the most common medical problem encountered preoperatively. Urinary tract invasion or compression was so frequent as to justify routine preoperative intravenous urography or cystoscopy. Preoperative Foley catheters and, occasionally, bilateral ureteral catheters were used. Preparation for surgery included restoration of chemical, hematologic, and nutritional deficiencies, sulfasuxidine, and a Miller-Abbott tube.

Patients with complete colonic obstruction required operative decompression (14.8%), either cecostomy or transverse colostomy. An additional 11.6 per cent were limited to palliative surgery, and 1.9 per cent were prohibitive surgical risks, making a total of 28.3 per cent. In lesions of the right colon, right colectomy is done with open anastomosis and proximal decompression by Miller-Abbott tube. For left colonic lesions, resection and primary anastomosis is preferred to stage resections. Despite wide perineal excision, perineal recurrence developed in 6 per cent of patients. For squamous cell carcinoma of the anus, the resection should be supplemented by bilateral radical femoro-iliac lymph node dissection about 10 days later.

The resectability rate was 84.4 per cent. Urinary tract infection accounted for the highest morbidity, and renal failure for the highest mortality. A 5-year follow up study was obtained in 93.6 per cent of eligible patients with a 5-year survival rate of 33.1 per cent (94.0 per cent of these clinically free of cancer). The rectosigmoid and rectal group of cancer patients showed a higher survival rate than those with right or left colonic lesions; patients in the former group with localized lesions had a 5-year survival rate of 70.3 per cent. The survival rate was naturally higher in patients whose lesions were histologically graded low or intermediate. —*S. Lloyd Teitelman, M.D.*

Bowel Function After Colectomy for Cancer, Polyps, and Diverticulitis. RICHARD C. LILLEHEI and OWEN H. WANGENSTEEN. *J. Am. M. Ass.*, 1955, 159: 163.

THE EXTENSION of limits of resection of the colon for carcinoma or polyps seems warranted, as in 38 per cent of patients in whom a total or subtotal colectomy was performed additional polyps were found in a segment of bowel believed to be normal preoperatively. Further, 18.6 per cent of the group reported either had or subsequently developed a second carcinoma of the colon. If such an extensive resection is to be accepted, morbidity and mortality rates would be no greater than after the standard operation.

The mortality rate reported from the same institution for colic resection was 5 per cent. The operative mortality attending total or subtotal colectomy was 5.5 per cent. At present the authors advocate total or subtotal colectomy for lesions higher than 10 cm. from the anus and distal to the hepatic flexure. In those in whom a segment of ileum must be removed, total colectomy is not recommended. Bowel function following extensive colon resection was normal if less than 20 cm. of ileum was removed even though the entire colon down to the rectum was excised.

The routine employment of total or subtotal colectomy for left colonic lesions will remove an appreciable number of unsuspected lesions, is not associated with a high mortality rate, and is not accompanied by bowel dysfunction provided less than 20 cm. of ileum is removed. A "second look" procedure seems indicated in patients in whom regional node metastasis was found at the initial operation.

—*Jerry A. Stirman, M.D.*

Pilonidal Sinus; a New Theory of Origin. ROGER BREARLEY. *Brit. J. Surg.*, 1955, 43: 62.

THE AUTHOR prefaces this article with the statement that today few British surgeons would accept the statement that pilonidal cysts and sinuses are congenital in origin. He reviews the historical aspects of pilonidal sinus and cites the natural history of the lesion.

From his observations in 2 cases he has proposed a theory of his own to explain the development of pilonidal fistulas. It is his feeling that they start from a puncture of the skin by the tip of a hair shaft. Eventually, when the hair is cast away from its root the sunken shaft is drawn in by a suction force that is set up by the movements of the buttocks.

In support of this theory, he draws attention to the lack of evidence of attachment of either end of the hair shaft that is found in pilonidal sinuses. Also, the recorded evidence of the presence of true hair follicles in the deeper areas of the sinus tract is noteworthy by its absence. The report in the literature of a case of pilonidal sinus in a barber's hand would further give support to a theory of penetration. Other reports show similar hair-containing lesions at various places of the body and in most of these a congenital inclusion type of origin is certainly open to question.

—*Matthew H. Evoy, M.D.*

UNIVERSITY OF MICHIGAN

The Surgical Anatomy of the Anal Canal. J. C. Goligher, A. G. Leacock, and J. J. Brossy. *Brit. J. Surg.*, 1955, 43: 51.

The material for this study has been obtained from three sources. Fourteen operative specimens of the rectum, removed in abdominal perineal resection, provided the histologic material. In some 90 clinical cases, during ordinary routine rectal examination, the opportunity was taken to identify by palpation certain parts of the anal musculature and to attempt to correlate the findings with the histologic conclusions reached. In addition, approximately a dozen people undergoing extensive rectal surgery were the subjects of a careful anatomic study of the muscular structure about the lower part of the rectum.

This article is very extensive and is well illustrated. Several color photographs are depicted.

The information gained from this study is very enlightening as it is at variance with commonly accepted principles. The sphincter usually identified during operations for hemorrhoids and anal fissures as the subcutaneous external sphincter muscle is in fact the rounded lower margin of the internal sphincter ani muscle. Anal fissures were usually found to lie upon the internal sphincter muscle and not the external sphincter; it is the lower part of the internal sphincter muscle that is usually divided during operation for this condition rather than the external sphincter muscle, as commonly thought.

A photograph is shown of a living patient in whom the musculature structure about the anus is well delineated through the unoperated skin and, using this specimen, the authors point out the pertinent anatomic features. In looking at this relaxed anus, a distinct outer circular ring is noted which corresponds to the external sphincter ani muscle. An inner ring, with the anal folds radiating inward from it toward its center, represents the lower rolled edge of the internal sphincter muscle. The interspincteric groove between the two muscles is well depicted in this photograph. —*Matthew H. Evoy, M.D.*

Complications Following Surgery for Benign Anorectal Lesions. Raymond E. Anderson, Guy V. Pontius, and Leon J. Witkowski. *J. Am. M. Ass.*, 1955, 159: 9.

The authors discuss ten common postoperative complications following surgery for benign anorectal lesions. Their discussion is practical both from the point of view of prevention and of treatment. In general, they believe that most complications may be avoided if the surgeon will pay attention to the technical details of the procedure and adhere to the basic principles of anatomy and physiology.

All the details of prevention and treatment cannot be presented in a brief summary, but a few of the more important points will be mentioned.

1. Postoperative hemorrhage should be watched for, treated actively, and controlled in the operating room if of any magnitude.

2. Frequent digital examinations and postoperative dilatations are essential. This prevents fecal impactions, lessens pain, improves drainage, lessens the chance of stenosis, decreases the chance of severe infection, and helps prevent a mucocutaneous fistula.

3. The mucocutaneous margin must be accurately restored or persistent mucous discharge, anal ulceration, or pruritis will result in many cases. The authors point out that a secondary plastic procedure is often necessary to correct this error.

The original article is worth reading for any surgeon doing a moderate amount of anorectal surgery. —*John C. Carlisle, M.D.*

The Formation of a Voluntary Anal Sphincter After the Method of R. R. Vreden (Text in Russian). A. M. Aminev. *Vestn. Chirurg.*, 1955, 75: 39.

In 1928 Vreden described the formation of a voluntary anal sphincter for the correction of anal incontinence. At that time the operation was described in the English language (*Arch. Surg.*, 1929, pp. 841–844) and later it became known as the Vreden-Stone operation. The author protests this change and proposes that the operation be known simply as the Vreden operation.

After its early application by Vreden, Stone, Ransohoff, *et al.*, the operation seems to have been largely forgotten. The author now reports his revival of the technique which he has applied in 3 instances.

The procedure is illustrated in the form of three schematic sketches. Essentially the method consists in the half encirclement of the anal aperture by each of 2 fascial bands procured from the fascia; these bands pass subcutaneously and laterally to a buttonhole in the gluteus maximus muscle which provides the voluntary contractile force needed for the closure of the artificial sphincter.

The first case reported by the author was that of a 33 year old male who was suffering from complete fecal incontinence as the result of a splinter wound received on the front line in the year 1941. When examined in 1947 on the author's service there was no evidence of sphincter action of the anal aperture. The mucosa of the lower end of the rectum was drawn over to the left buttock and fastened by scar tissue at this point. By means of a small preliminary procedure the mucosa of the rectum was freed and the rectal lumen restored. In a second session the Schumacker operation was carried out; that is, a muscle flap was brought over from each gluteus maximus muscle subcutaneously to half-encircle the anal aperture from each direction. This operation proved unsuccessful, except for a brief initial success, and at the later operation the muscle flaps were found to have degenerated into fibrous tissue. The typical Vreden operation was then performed with success; the patient can now retain the feces, and even gas, voluntarily for as long as needful. This last operation was done in 1953. Of course, the time is still too short to speak of definitive results; however because of the normal innervation of the muscular motor (gluteus maximus muscle) there is no reason for anticipating later failure in the functioning of the artificial sphincter.

The second patient was operated upon during the year 1954. In this patient a suppurative process had destroyed a portion of the fascial encirclement; nevertheless, the new artificial spincter continued to function sufficiently for the voluntary retention of feces and gas.

The third patient, also operated upon during 1954, suffered from incontinence as a result of a recurring prolapse of the rectum of large size (12 cm.). With the successful completion of the Vreden operation the prolapse disappeared and the patient has since been able to retain feces and gas. The finger introduced into the anus feels the resilient response of the new sphincter ring.

The author has introduced a few minor modifications of the original Vreden operation. The most important ones consist in the radially radiating incision, replacing the circumanal incision of the original operation, the use of a special forceps (Phedorov's) for the subcutaneous conduction of the fascial bands, the soaking of the fascial bands before use in a solution of penicillin, and the injection of streptomycin at daily intervals for 1 to 2 weeks in the postoperative period.

In conclusion, the author insists that the operation of R. R. Vreden be considered the surgical method of choice in cases of total loss, or total functional failure, of the anal sphincter. —*John W. Brennan, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Hepatic Coma; a Clinical and Pathologic Study. William T. Foulk, Hugh R. Butt, Maurice H. Stauffer, Archie H. Baggenstoss, and John B. Gross. *Gastroenterology*, 1955, 29: 171.

The purpose of this study was to analyze a group of patients with hepatic coma to determine whether there were present any common factors precipitating the coma or any common denominator that might account for recovery. The study also afforded an opportunity to evaluate recorded clinical, chemical, and other data that might be available before and after the onset of deep hepatic coma.

A review was made of the records of 52 consecutive patients who were seen in hepatic coma at the Mayo Clinic. The clinical or pathologic diagnosis was cirrhosis in 23 of these patients, one of whom also had hemochromatosis. In 9 patients the diagnosis was hepatitis; in 4 it was biliary cirrhosis secondary to common-duct stricture or stone; in 11 it was obstructive jaundice, and in 5 it was neoplastic malignant involvement or abscess of the liver. No close correlation was noted between the clinical or laboratory evidence of severe hepatic dysfunction and the development of coma.

Factors that might have precipitated coma in this group of patients with hepatic insufficiency were sought. Hemorrhage, infection, paracentesis, and surgical procedures appeared to be responsible for the onset of coma in some. Autopsy was performed in 44 of the 47 cases in which death occurred. Pathologic evidence of recent parenchymal damage was striking in 14 of the 20 cases in which the diagnosis at autopsy was cirrhosis; such evidence was present in all cases in which death was the result of fulminating hepatitis, obstruction of the biliary tract, or hepatic neoplasm. The mean weight of the liver was smallest in those cases in which fulminating hepatitis was the cause of hepatic insufficiency. The largest livers were found in the cases in which obstruction of the biliary tract or metastatic neoplasm accounted for the hepatic coma.

Management of the patient who has hepatic coma is outlined. Enthusiasm for minute detail, particularly in relation to fluid and electrolytic abnormalities in these patients, is emphasized.

Lobar Segmental Resection of the Liver (Contributo alla conoscenza della struttura segmentaria del fegato in rapporto al problema della resezione epatica). M. Mancuso, E. Natalini, and G. del Grande. *Policlinico, sez. chir.*, 1955, 62: 259.

By means of angiographic and plastic preparations, the authors have studied the subdivision of the normal human liver in segmental units.

As in pulmonary surgery, ligation of the hilar vessels to known segments will cause an immediate anoxia of the involved area with a consequent change in color which delineates the segment.

These studies led the authors to conclude that there are definite independent vasculobiliary pedunclés, both lobar and segmental. This makes it possible to perform lobectomy and also segmental resections of the liver. They draw attention to the difficulties encountered when atypical resections are performed. —*Lucian J. Fronduti, M.D.*

Visualization of the Biliary Ducts by Means of the Intravenous Injection of a New Contrast Medium. Alexander J. Link, Raj K. Parida, Julius Heydemann, and Robert M. Kark. *J. Am. M. Ass.*, 1955, 158: 1491.

The intravenous injection of sodium iodipamide (cholografin) usually permits x-ray visualization of the extrahepatic biliary ducts in 10 to 30 minutes and of the gallbladder in one-half to 2 hours. About 90 per cent of this medium is removed from the blood stream by the liver and the remainder is excreted through the kidneys. Unlike with previous contrast media, concentration by the gallbladder is not necessary for visualization. Hence, this method is useful in bile duct visualization after cholecystectomy.

To evaluate the efficacy and safety of this new contrast medium, results were reviewed in 21 patients subjected to the method. Three of these had no history of gallbladder disease and good visualization was obtained in all 3. Of 5 patients with other findings indicating hepatobiliary disease, without previous surgery, 4 showed satisfactory visualization. The one with nonvisualization had biliary cirrhosis. There were 13 patients with the so-called postcholecystectomy syndrome and in 8 of these the bile ducts were well visualized. A common duct stricture was accurately diagnosed preoperatively in one of these, and in 2 cases the visualization of normal ducts aided in reaching a diagnosis of recurrent pancreatitis. There were 11 patients who had abnormal liver function tests and only 6 of these had good visualization. Only 1 patient showed deterioration of liver function that could be attributed to the contrast medium.

None of the patients showed any serious ill effects from the injection of the medium. About half of them had minor side effects, such as a peculiar smell or taste, or slight nausea. A slow rate of injection was believed to help prevent reactions.

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This new contrast medium is a useful adjunct in the diagnosis of biliary disease and is nontoxic.

The results are quite likely to be unsatisfactory in persons with severe liver dysfunction.

—Stanley W. Tuell, M.D.

Biliary Peritonitis Following Spontaneous Perforation of the Common Hepatic Duct (La peritonite biliare; considerazioni anatomopatologiche su di un caso di perforazione spontanea del dotto epatico comune). G. Bracali, A. Camera, F. Marzullo. *Arch. ital. mal. app. diger.*, 1955, 21: 247.

The authors report on biliary peritonitis resulting from a spontaneous perforation of the common hepatic duct in a 58 year old female. The patient was admitted with the diagnosis of an acute condition of the abdomen. Soon after admission a cardiovascular collapse occurred and the patient died a few hours later. She had had dyspeptic symptoms of about 2 years' duration. Several days before admission a subicteric tinge of the skin was noted. A few hours before she was brought to the hospital she began to have nausea, vomiting, and pain in the right hypochondriac region, and also diarrhea.

An autopsy was performed and biliary peritonitis was found with about 200 c.c. of free bile in the abdominal cavity. The liver was enlarged while the gallbladder was markedly contracted and fibrotic. A perforation was found on the inferior surface of a dilated common hepatic duct about 1.5 cm. from the hilum of the liver. The liver presented a pseudocirrhotic picture on microscopic study. The biliary ducts showed fibrosclerosis.

Several theories as to the probable cause of the perforation are discussed. There was no organic obstruction present. The authors believe that increased biliary pressure was brought about by nervous influences (biliary dyskinesia), which resulted in the perforation of a diseased duct.

—Lucian J. Fronduti, M.D.

Annular Pancreas: Its Roentgen Diagnosis and a Report of a Case Preoperatively Diagnosed and Successfully Treated Surgically. Herbert S. Berlin and Julius Taylor. *Gastroenterology*, 1955, 29: 439.

The exact mechanism which takes place in the formation of the annular pancreas is indefinite, but probably it is caused by the persistence of the pair of ventral buds and the growth of the left lobe of the ventral pancreas encircling the duodenum.

Diagnostically, the burden falls upon the roentgenologist. Usually a smooth uniform constriction, several centimeters in height and extrinsic in nature, is noted in the descending duodenum. Secondary dilatation of the proximal duodenum and stomach may be observed. The finding of an atrophic-appearing mucosa in the narrowed segment may clinch the diagnosis.

The author reports a case of annular pancreas, which is the sixth one to date to be correctly diagnosed preoperatively. A simple by-passing procedure effected complete relief of the patient's complaints without morbidity or recurrence of symptoms in a 16-months' period following the gastroenterostomy. The author believes that this result lends support to the simple by-pass as the procedure of choice in the treatment of duodenal obstruction due to annular pancreas.

—Ely Elliott Lazarus, M.D.

The Surgery of the Annular Pancreas; a Summary of 60 Patients Operated Upon. Morton J. Tendler and Andrea Ciuti. *Surgery*, 1955, 38: 298.

The embryological development of the pancreas is described and the theories of formation of the annular pancreas are briefly reviewed. The more frequent complications of this otherwise innocuous developmental abnormality are described as those of duodenal obstruction with dilatation of the proximal duodenum, compression of the common duct, and gastroduodenal ulcerations. The clinical symptoms are those usually related to duodenal obstruction. Diagnosis is confirmed by x-ray when the characteristic "double bubble" is present.

The operations performed for the relief of this condition are reviewed and 60 cases are tabulated chronologically. A 20 per cent mortality occurred among this group. About one-third of the patients were infants under 1 year old, and most of the remainder were individuals in the third, fourth, and fifth decades of life. While resection of a part of the ring has been accomplished successfully in some cases, a shunting procedure is generally preferred. The authors present two cases. In one they performed a duodenoduodenostomy and in the other, a duodenojejunostomy. Both patients were cured.

—David T. Petty, M.D.

Pancreatic Lithiasis (Lithiase du pancréas). Lucien Leger and Jacques Lataste. *J. chir.*, Par., 1955, 71: 813.

Improvements in roentgenographic technique are responsible for the fact that the diagnosis of pancreatic lithiasis is being made much more frequently than in former years.

True canalicular lithiasis and parenchymatous calcifications represent two distinct entities from the pathogenic as well as from the therapeutic point of view, although some writers speak only of lithiasis and others only of calcifications. The dual theory is less popular in the United States than in Europe. The condition is found most frequently in the fourth and fifth decades of life.

In true lithiasis the precipitation of calcium leads to an increase of calcium in the pancreatic juice, whereas calcium deposits in the foci of liposclerotic degeneration signify degenerative pancreatitis. The authors are of the opinion that intraparenchymal calcifications are always accompanied by stone formations but, conversely, isolated stones may occur, although sooner or later stasis and infection create pancreatitis with calcareous deposits.

The underlying cause of primary lithiasis is a canalicular inflammation of retrograde origin, the infection spreading from the duodenum, gallbladder, or the common duct. The authors reject the theory of lymphogenous or hematogenous origin of the infection. Debris deriving from desquamated epithelium forms the nucleus of a stone.

Pancreatic lithiasis may remain asymptomatic over a long period of time because the canalicular obstruc-

tion may be incomplete and because saliva, bile, and intestinal secretions take over the function of pancreatic juice. Violent pain in the epigastric region, digestive disturbances, loss of weight, jaundice, or hyperglycemia should focus the physician's attention on the pancreas. A tortuous, horizontal shadow, caused by calcification of the splenic artery, may erroneously be interpreted as a stone in the pancreas. Not all pancreatic calculi present a radiopaque appearance.

Secondary local infection is infrequent. Retention cysts or inflammatory pseudocysts may complicate the picture.

The treatment of a crisis is conservative. Morphine may provoke or augment a spasm of the sphincter of Oddi. Parasympathicolytic drugs, such as atropine or banthine, or an intravenous administration of procaine, reduce the spasm and also the amount of pancreatic secretion. Splanchnic anesthesia or epidural block may give relief to the patient. Fasting, and gastric or duodenal aspiration reduce the acid secretion of the stomach and, indirectly, the external secretion of the pancreas.

In the majority of cases amelioration is only temporary, so that an exploration cannot be avoided. Pancreatolithotomy is usually crowned with success only if a solitary calculus is present. The authors prefer a transpapillary transduodenal drain to a T-tube with a transpapillary branch. It is advisable to supplement drainage with sphincterotomy. In selected cases pancreaticojejunal anastomosis, with a Roux defunctionalized segment, may render good results. To obtain atrophy of the parenchyma and to suppress pain caused by an incomplete blockage of excretory paths, ligation of Wirsung's canal may be performed. Ligation en masse is unsatisfactory and ligation of isolated ducts is technically difficult. Partial pancreatectomy may also be difficult because the line of cleavage is not easily established in the presence of adhesions. The operative risk of a total pancreatectomy is out of proportion to the gravity of the condition.

The following extrapancreatic interventions may be considered. Cholecystectomy is justified only in the presence of associated cholelithiasis. Drainage of the common duct may furnish good results in chronic pancreatitis. Sphincterotomy is also of great value. The vagus nerve does not carry sensory fibers, hence vagotomy has no analgesic effect, whereas splanchnicectomy may give symptomatic relief and may be considered if preceding interventions have failed.

The authors emphasize the clinical importance of operative pancreatography after pancreatotomy and extraction of a calculus because it serves as a guide for the selection of supplemental procedures.

—Joseph K. Narat, M.D.

Nonparasitic Cysts of the Spleen. J. K. C. Rijsbosch. *Arch. chir. Neerl.*, 1955, 7: 250.

The author reports 3 cases of nonparasitic cysts of the spleen and discusses the etiology and development of splenic cysts. Most patients with this condition seek help because of symptoms due to compression of the adjacent organs. These symptoms are largely distress in the left upper abdomen, occasionally radiating to the left shoulder, and some digestive disturbances. Very rarely are there any respiratory or circulatory disturbances.

Although radiologic procedures may be of help in establishing a diagnosis, sometimes it can only be made at operation.

Treatment, of course, is splenectomy, which carries a reported mortality of 4 per cent; undoubtedly the current risk is much lower than this figure would indicate.

—Franklin Lounsbury, M.D.

MISCELLANEOUS

Indications and Contraindications to Postoperative Hypodermoclysis with Hyaluronidase in Surgery of the Digestive Tract (Indications et contre-indications de l'hypodermoclyse postopératoire avec hyaluronidase en chirurgie digestive). A. G. Weiss and L. Hollender. *J. chir.*, Par., 1955, 71: 673.

Following a brief discussion of the drawbacks of venoclysis—intra-arterial, intraperitoneal, rectal, and intraosseous administration of fluids—the authors describe the advantages of, and the contraindications to hypodermoclysis in combination with hyaluronidase.

This enzyme destroys temporarily the interstitial barrier whose gelatinous consistency is due to acid mucopolysaccharides, chiefly hyaluronic acid. By the process of depolymerization, this acid loses its physical condition of a gel and assumes the consistency of a sol, thus facilitating the transit of fluids.

Hyaluronidase augments from three to four times the absorption of fluids administered subcutaneously. The rate of absorption depends on the type of fluids used. For instance, a 0.9 per cent saline solution is absorbed more rapidly than a 0.5 per cent glucose solution, while a 1.9 per cent alcohol solution is absorbed more slowly than glucose. Ascorbic acid, adrenoxyl, and phenergan inhibit to a great extent the effect of hyaluronidase. The acceleration of resorption of macromolecular fluids, such as dextran, by hyaluronidase is insignificant. It follows that this method is useless in the treatment of circulatory collapse.

Hypodermoclysis in combination with hyaluronidase is considered by the authors a more physiologic route of administration of fluids than venoclysis.

This method is contraindicated (1) in diabetes; (2) in malignant tumors, because, according to some authors, hyaluronidase favors dissemination of epithelial or mesenchymal malignant cells; (3) in local infectious processes or septicemia, because the increased permeability of tissue may intensify the diffusion of pathogenic micro-organisms; (4) in dermatoses, particularly eczema; (5) in hypoproteinemia, because the risk of edema is great.

Clinical observations on 300 patients demonstrated the usefulness of this method. This conclusion was corroborated by plasma volume determinations after hypodermoclysis with and without hyaluronidase. Hyaluronidase should not be employed when cortisone, ACTH, antihistaminic, or estrogenic substances are administered because they render the intercellular cement resistant to the enzyme and inhibit its effect.

—Joseph K. Narat, M.D.

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Clinicoroentgenologic Syndrome of Ossification at the site of a Xiphoumbilical Postlaparotomy Cicatrix; with 6 Personal Observations (Sindrome clinico-radiologica di ossificazione in sede di cicatrici post-laparotomiche xifo-ombellicali; col contributo di 6 casi personali). FRANCO CHIARIOTTI. *Radiol. med.*, Milano, 1955, 41: 625.

SIX INSTANCES of calcification of the healed cicatrix of an upper abdominal incision were observed among 64 laparotomy wounds examined roentgenologically. These 6 patients were males (there were only 9 females in the material examined) whose ages ranged from 28 to 70 years. Examinations were made from 60 days to 9 months after the laparotomy wound had healed.

In 4 instances the area of ossification was observed to be independent of the xiphoid bone; in 1 instance it had formed a neoarthrosis with this bone, and in the remaining instance it was solidly united with the xiphoid bone.

Clinically there was little to draw the patients' attention to the condition. One patient, a physician who had been operated upon for cancer of the stomach, noted the firmness of the scar, attributed it to a recurrence of the neoplasm in the abdominal scar, and committed suicide. At autopsy the calcification of the scar could be found, but no evidence of recurrence of the malignancy.

In one patient the slipping or sliding sensation when bending or squatting was noted; in another patient who showed solid union of the plaque with the xiphoid, the same movements resulted in pain in the epigastrium. In all but one of the remaining patients the slipping or sliding sensation could be elicted in the bending or squatting postures when deliberately sought. These sensations were apparently the result of the plaque slipping past the lower end of the xiphoid, either in front of or behind this bone.

It would seem obvious that the condition should be more widely recognized and specifically sought in patients presenting unusual symptoms in the upper abdomen. On the basis of the author's experience he designates the roentgenologic and clinical findings of slipping and sliding sensations upon assuming certain body postures and the pain on pressure over the epigastrium as the "clinicoroentgenologic syndrome of cicatricial calcification . . ."

The serologic findings were all within the limits of what might be considered normal, and the author does not try to choose between the various theories (calcification of a hematoma; migration of osteoblasts; osteoblastic metaplasia of connective or mesodermic tissues) nor suggest why the condition seems to occur with especial predilection in the upper abdominal scar. —*John W. Brennan, M.D.*

GYNECOLOGY

UTERUS

Traumatic Laceration of Uterine Support; The Clinical Syndrome and the Operative Treatment. Willard M. Allen and William H. Masters. *Am. J. Obst.*, 1955, 70: 500.

A series of 28 cases of a syndrome called "universal-joint" cervix is presented in detail. These patients complain, as do those with Taylor's pelvic congestion syndrome, of dyspareunia, excessive fatigue, dysmenorrhea, pelvic distress, emotional instability, metrorrhagia, and premenstrual defecation pain. A careful history will elicit the facts that symptoms date from the time of a specific delivery and that the delivery was either precipitous or in the nature of a difficult surgical delivery.

Bimanual examination always reveals the corpus in severe third-degree retroversion. The cervix can be moved in any direction without corresponding motion of the corpus (as though the cervicouterine junction is a universal joint). There is pain on motion of the cervix, the corpus will appear to be twice the normal size, and frequently large prolapsed ovaries are present.

Findings at laparotomy reveal lacerations of the broad ligament occasionally extending into Mackenrodt's and uterosacral ligaments. These lacerations may be unilateral but are most often bilateral. The torn peritoneal edges of the lacerations may be seen to weep serous fluid and such free fluid is an almost constant finding in the free peritoneal cavity at the time of laparotomy.

Surgical correction consists of simple approximation of the torn fascia and peritoneum in layers.

The reported long term postoperative relief of the original complaints is unusually good. The corpus lies in normal position, responds to motion of the cervix, and returns to normal size. The cervix is nontender on motion and the ovaries are no longer prolapsed.

—*M. Leon Tancer, M.D.*

Calcification of Fibromyoma Uteri; Clinical and Anatomopathologic Consideration of 4 Cases (Sulla calcificazione dei fibromiomi uterini; contributo clinico ed anatomo-patologico di quattro casi). Angelo Migliavacca. *Ann. ostet. gin.*, 1955, 77: 331.

In only 1 of the 4 cases considered could the diagnosis of calcification of fibromyoma uteri be made preoperatively. This was a tumor, the size of a small orange, which was attached to the posterior surface of the uterus and low enough to be well palpated from the cul-de-sac. In the other 3 cases the detection of the calcification of one of the fibromyomatous nodules was practically impossible. In 1 instance this was due to the fact that the nodule was very small (cherry-sized), and in the 2 other the calcified nodule was located interstitially.

In all of these instances the anatomopathologic findings were rather uniform. In 3 there was a complete shell of calcareous substance enveloping the poorly calcified or noncalcified fibromyomatous tissues within. In the fourth case the calcareous shell was incomplete. In all of the cases the contained tissues had undergone marked deterioration, presenting the histologic characteristics of the so-called "red myoma." Evidently the calcareous shell produced in these tumors curtailed the blood supply to the tumor with resulting trophic changes.

The author particularly emphasizes these trophic disturbances with reference to the pathogenesis of these calcareous deposits themselves; in fact, it is well known that the sedimentation of calcium in the tissues usually occurs in tissues which show degenerative alterations; and it is indeed a rarity that this process develops in perfectly normal tissues. It is evident, of course, that the necrotic or necrobiotic milieu is in itself not sufficient to determine the deposition of these salts; some other factor must be present.

In reference to this other factor, the author recalls the statement of Pullé to the effect that in the pathogenesis of calcification of uterine fibromas both necrobiosis and atheromatosis may co-operate in the production of this particular type of degenerative change. In this connection it may be remembered that the interpretation of the pathogenesis of the atherosclerotic lesion on the basis of the dominant hypercholesterolemia has the support of clinical and experimental findings, and that hypercholesterolemia appears to be connected with the particular humoral state of the fibromatous patient. This is perhaps characterized by disturbances of the functional equilibrium of the ovariosuprarenal axis and the metabolism of the sterols (Moracci: *Arch. ostet. gin.*, 1950). Thus, the author believes that to the terrain naturally favorable to the production of calcification (the necrotic tissue) there is added the further influence of the hypercholesterolemia which produces a particular concentration of the calcareous salts at this spot and favors their precipitation.

In addition, of course, physicochemical conditions must exist in the necrotic foci of the uterine fibromyoma and facilitate the absorption of the calcium salts on the part of the tissues or modify the composition of the liquids irrigating the tissues so that the solubility of the salts of calcium in this fluid becomes lowered.

—*John W. Brennan, M.D.*

The Problem of So-Called Surface Carcinoma of the Portio (Das Problem des sogenannten Oberflaechenkarzinoms der Portio). H. Runge and P. Stoll. *Deut. med. Wschr.*, 1955, 80: 1069.

Surface carcinoma, or carcinoma in situ, presents several problems. It is in need of exact definition so that its preceding stages can be recognized and the changeover to invasive cancer determined. The authors believe that gland involvement in itself does not constitute invasion. The two main methods of detection, cytology, and colposcopy must be broadened and more frequently utilized.

Historically, carcinoma in situ is not a new entity. In 1908, Schauenstein described the lesion and called

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it surface carcinoma. Rubin, in 1910, called it incipient carcinoma. In 1928, Schiller suggested the term preinvasive carcinoma. Beginning in 1924, Hinselmann has designated various degrees of cervical epithelial atypism ranging from *Rubriks* I to IV. Anderes and his followers introduced a classification of normal, restless, and atypical epithelium. Held speaks of abnormal, suspicious, and noninvasive atypical squamous epithelium, the latter being identical with the usual concept of carcinoma in situ. Moricard speaks of early stages as being dystrophic changes.

The diagnosis must not be made from a single biopsy since other sections may show invasive cancer. During pregnancy, care must be taken to take into account the normally increased epithelial activity. Each case must be studied, evaluated, and treated individually. —*Warren R. Lang, M.D.*

New Concepts in the Treatment of Carcinoma of the Cervix. JEFCOATE HARBUTT. *N. Zealand M. J.*, 1955, 54: 356.

IT IS PARAMOUNT that therapy in carcinoma of the cervix be individualized. No longer must treatment remain stereotyped, and the patient be made to conform with the treatment. Therapy must be such that it will call upon all our resources, whether irradiation or surgery, or a combination of both, in order to give the individual the optimum chance of survival.

It is equally important to concentrate the care of these patients in the hands of a limited number of clinicians. When patients are given radiotherapy, it is essential to have a radiotherapist as a member of the team, since, as gynecologists, we must admit to a limited knowledge of the science of radiation therapy.

In the treatment of carcinoma of the cervix, it has been stated that any marked improvement in results is likely to come from earlier diagnosis rather than from improvement in existing techniques. This is true because, with the therapeutic weapons already available, we can cure almost all malignant growths of the cervix, provided diagnosis is sufficiently early.

Because the efficacy of treatment is so closely related to early diagnosis, vaginal smears should be made, affording the opportunity of making a diagnosis in preclinical asymptomatic cases; their value has been substantiated. Mass screening, although acknowledged to be ideal, has been found impracticable from the economic viewpoint, but selective screening of cancer-prone patients should be part of the service in any gynecological clinic.

Three broad principles form the basis of treatment for carcinoma of the cervix. Firstly, treatment must not be sterotyped but should be devised to meet the condition of each individual patient. Secondly, treatment should be concentrated in the hands of a limited number of gynecologists working in conjunction with a radiotherapist. Thirdly, an efficient follow-up system is essential.

It must be emphasized that carcinoma in situ is a slowly progressive disease which allows for almost leisurely investigation without detriment to the patient, and that many intraepithelial cancers do not progress to the invasive state.

Errors in the diagnosis of carcinoma in situ are common, and repeated biopsies may be necessary. Two conditions frequently cause confusion: both pregnancy and local infection may produce a basal cell hyperactivity which can be indistinguishable morphologically from intraepithelial cancer, and repeated biopsies postpartum, or after infection has subsided, are necessary to confirm the diagnosis. There is little unanimity covering the status of carcinoma in situ, and the problem regarding diagnosis and treatment is as yet unsolved.

—*Charles Baron, M.D.*

A Reappraisal of the Diagnosis in Uterine Sarcoma; a Review of 49 Cases. MORTON A. SCHIFFER, ABRAHAM MACKLES, and SAMUEL A. WOLFE. *Am. J. Obst.*, 1955, 70: 521.

FORTY-NINE cases of nonepithelial malignancy of the uterus were reported from the laboratory of the Jewish Hospital of Brooklyn, in a 15-year period. Forty-eight of these lesions were diagnosed as sarcoma, and one as a hemangioendothelioma. This material was reviewed microscopically, after which reference was made to the clinical material with follow-up.

Twelve cases were reclassified as myomas, either cellular or with degenerative change. Follow-up for periods of 3 to 7 years in 11 of these cases revealed no evidence of previous malignancy. Three patients whose lesions were rediagnosed as inflammatory polyp, stromatous endometriosis, and myoblastoma were alive and well on follow-up study. Three cases were rediagnosed as endometrial carcinoma, and one case as a spindle-celled carcinoma of the cervix.

Pathologic differentiation of tumors which originated in the endometrium, the uterine wall, or in a leiomyoma presented no problem. The real problem was whether or not a tumor, nonendometrial in origin, was, in fact, malignant. Cellularity was often misdiagnosed as sarcoma and represented the greatest single source of error. A second problem was to classify those tumors which were malignant. This was often impossible, and 4 tumors were diagnosed as unclassified sarcoma.

Eight of the 49 patients had previously undergone radiation menopause for presumably uterine bleeding of benign origin. Of these, 5 eventuated in malignancy—one case within 2 years, and 4 cases in from 6 to 21 years after irradiation.

Symptoms included postmenopausal bleeding, irregular bleeding during menstrual life, mass, pain, vaginal discharge, and weight loss. The recommended therapy is complete hysterectomy and postoperative irradiation. The prognosis is poor and only 5 of the patients (19%) in this series were known to be alive for more than 5 years.

—*M. Leon Tancer, M.D.*

ADNEXAL AND PERIUTERINE CONDITIONS

Ovarian Tumors; a Survey of All Surgically Treated Ovarian Tumors in a Large General Hospital Over a 10 Year Period. WELDON K. BULLOCK, RICHARD E. HOUTS, and JOHN J. GILRANE. *Arch. Surg.*, 1955, 71: 153.

THE PURPOSE of the present report was to analyze the pathologic data from 331 patients who had 336 ovarian tumors. The material was collected from a

total of 478 cases of ovarian neoplasms which were surgically treated in the 10 year period from 1944 through 1953. The study included only histologically verified cases for which complete clinical records were available.

In terms of decreasing numerical frequency, the tumors which occurred most frequently were serous cystomas, dermoids, mucinous cystomas, thecoma-fibromas, adenofibromas, granulosa-celled tumors, adenoacanthomas, and Brenner tumors. The serous cystomas comprised 30.6 per cent of all tumors and 62 per cent of all cystomas; 58 per cent were benign and 80 per cent were unilateral. The mean age of occurrence was 54.3 years. The mucinous cystomas comprised 19 per cent of all tumors and 38 per cent of the cystomas; 65 per cent were benign and 95 per cent were unilateral.

When subjected to statistical analysis in the malignant serous unilateral lesions, the age of Negroes was significantly lower than that of Caucasians (harmonic mean 32.7 and 63.1 years, respectively). There was a significantly greater proportion of Negro patients with dermoids than with serous and mucinous cystomas. The Negro population of the hospital was approximately 20 per cent of admissions during this study, while 50 per cent of the dermoids occurred in Negroes.

Six adenoacanthomas of the ovary are reported. Two of these were unilateral and occurred in patients in whom the uteri were without evidence of cancer. Two were traceable to ovarian serous cystadenocarcinomas (one bilateral and one unilateral), and the endometrium in each of these had a small adenoacanthoma. The others were considered to be metastatic from an adenoacanthoma of the endometrium.

Hormone-producing tumors may produce either estrogens or androgens. The estrogen-producing tumors are the granulosa-cell tumor, thecomas, and tubular androblastomas. The androgen-producing tumors are the arrhenoblastomas, and masculinovoblastomas.

No attempt is made in this paper to give a complete breakdown on the type of surgery performed in each of the described types of tumor. Of the 331 patients, 16 had what the surgeon considered an inoperable cancer, and only a biopsy was done. The remainder had either a unilateral or bilateral oophorectomy and/or some form of hysterectomy. Seventeen of the patients with malignant tumors had postoperative radiation therapy.

Torsion was noted most frequently with dermoid tumors, and occurred in 21 per cent.

—*Ely Elliott Lazarus, M.D.*

Benign Cystic Teratomas of the Ovary; a Clinico-statistical Study of 1,007 Cases with a Review of the Literature. WILLIAM F. PETERSON, EDWARD C. PREVOST, FREDERICK T. EDMUNDS, J. MASON HUNDLEY, JR., and FRANK K. MORRIS. *Am. J. Obst.*, 1955, 70: 368.

THE AUTHORS have investigated a series of 1,007 cases of benign cystic teratoma (dermoid cyst) of the ovary seen at several Baltimore hospitals, and includes cases from the records of the Armed Forces Institute of Pathology. Statistically these tumors constitute about 11 per cent of all ovarian tumors; they have no predilection for one side, are not infrequently bilateral, and may be found at any age. In this series, 18 cases occurred in children less than 14 years of age, and the majority of cases were in the 20 to 30 year age group. The sizes of the tumors varied between 2 cm. and 45 cm. in diameter, two-thirds of them measuring 5 to 10 cm.

There are no pathognomonic signs of this entity. One-half of these patients had pain, 15 per cent noted an abdominal mass or swelling, and 15 per cent had abnormal bleeding, the etiology of which is still doubtful; 23.2 per cent were asymptomatic. X-ray is very valuable in the diagnosis. In the present series only 96 cases, or 9.5 per cent, were correctly diagnosed preoperatively, two-thirds of them with the help of the x-ray. Roentgenograms of the abdomen were taken in 102 patients, and 62 of them had findings suggestive of benign cystic teratoma. According to the literature, from 25 to 49 per cent of these tumors produce radiopaque bodies; other cases may be correctly diagnosed by the increased density of the capsule of the cyst and the decreased density and mottled or banded appearance of its interiors.

Torsion, the most common complication, occurred in 16 per cent of the present series. These tumors seem to twist more easily, and it appears from the literature that one-third of all twisted ovarian tumors are benign cystic teratomas. Marked torsion with gangrene of the pedicle, rupture of the cyst, or parasitic detachment should be mentioned as curiosities. The old belief that these tumors are particularly susceptible to infection has been refuted by many authors. In this group, 12 cases of infection (1.2 per cent) were found which could, in some instances, be related to torsion, pregnancy, or pelvic inflammation. Infected cysts rupture more easily and should be treated conservatively until infection is controlled. To date, only 40 cases of intraperitoneal rupture, and only single instances of rupture into a hollow viscus have been reported. One of the 13 patients with a ruptured cyst died, probably as a result of the associated infection. No attempt was made in these cases to remove all of the spilled granulomatous masses.

Pregnancy was present in 12.8 per cent of the cases and appeared to increase the risk of all types of complication. Four of these cysts ruptured in the immediate postpartum period. Since benign cystic teratomas have a tendency to remain within the confines of the true pelvis, they are very likely to obstruct labor. "Tumor previa" was found in 14 per cent of the pregnant patients. A total of 37.5 per cent of those that went to term had dystocia and were delivered by cesarean section, followed by removal of the cyst.

The optimal time for surgical intervention during pregnancy is the fourth to sixth month. In the first trimester the risk of abortion is too great to do elective abdominal surgery. In the third trimester it can usually be decided to remove the cyst at the time of section if it is in a position to cause dystocia. If the patient is allowed to deliver vaginally, the ovarian cyst should be removed very early in the puerperium because of the high incidence (close to 25 per cent) of torsion, rupture or infection.

Malignancies are comparatively rare. So far, only 76 cases of squamous cell carcinoma in a cystic tera-

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toma have been reported in the world literature, and only a few cases of other malignancies. The authors found 8 (0.8 per cent) carcinomas in their series. The occasional finding of localized malignant degeneration in one microscopic slide, particularly in areas near the so-called "dermoid plug," seems to warrant careful search. The prognosis for these malignancies is very poor, probably in the neighborhood of 20 per cent 5-year survival. A plea is made to conserve ovarian tissue at the time of surgery, if possible. —*W. D. Bergman, M.D.*

MISCELLANEOUS

The Management of Anomalies of the Genital Tract. SIDNEY R. LASH and A. F. LASH. *Am. J. Obst.*, 1955, 70: 383.

THIRTY-FIVE cases of congenital anomalies of the female genital tract are described—excepting hermaphroditism and congenital cysts. There were 7 cases of partial or total absence of the vagina, usually associated with defects or absence of the uterus and cervix. These deformities were due to nonfusion between the bilateral Müllerian anlage or between the Müllerian and cloacal tissues or to noncanalization of the vaginal plate. One patient with absent vagina had rudimentary tubes, a left, solid uterus without cervix, and a granulosa-cell tumor of the left ovary. There were 2 unicornate uteri. A third group with normal fusion of the Müllerian tissue showed anomalies of the tubes in 3 cases, either with a double fimbriated end of the tube, or representation of the tubes by fibrous cords. The remainder consisted of 6 cases of septate uteri, 7 cases of uterus bicornis unicollis, 9 cases of uterus bicornis bicollis (didelphis), and a few other cases. Many of the case reports are given in detail.

For the diagnosis, roentgen films, with the use of lipiodol in the uterus, transvaginal or transabdominal pneumoperitoneum, and/or probing are usually necessary before resorting to laparotomy. The frequent association of these anomalies with displacement or agenesis of parts of the urinary system makes urologic studies imperative.

The following therapeutic problems will arise with these deformities:

In children, surgical intervention is rarely required. At the age of the menarche an opening for the menstrual flow might have to be constructed. In vaginal defects, the establishment of a copulative canal might be important even if a pregnancy cannot be expected. Septate uteri will require hysteroplastic operations, particularly if they are the cause of habitual abortion. The high incidence of atypical pregnancy and atypical presentation in those that reach viability frequently lead to surgical or obstetrical intervention.

Twenty-two patients with septate or bicornate uteri had a total of 67 pregnancies. Of these, 16 ended in abortion, 8 in premature labor, and 13 had breech presentations. Twelve cesarean sections were done, and 31 patients were delivered vaginally at term. The authors feel that, in view of the high rate of normal delivery, cesarean section has no place in the management of the pregnant double uterus except in the presence of definite obstetrical indications. If the uteri were examined more often after termination of abnormal pregnancies, especially in patients who have had habitual abortion, after transverse and breech presentations, and after repeated anomalies of placentation, a much higher incidence of these defects might be encountered. —*W. D. Bergman, M.D.*

Vesicovaginal Fistulas; a Report on the Vaginal Repair of 160 Cases. DENIS W. P. LAVERY. *J. Obst. Gyn. Brit. Empire*, 1955, 62: 530.

THE PRESENT study is based on the total number of patients with vesicovaginal fistula, uncomplicated or with other pelvic injury, admitted to the hospital in a 3.5 year period. The average age of the patients was 23 years. The origin of the fistula was obstetric in all but 3 cases. The average duration of the fistula was 20 months. Numerous other complications were found in association, such as third degree laceration, rectovaginal fistula, and neurologic injuries.

Preoperatively these patients were treated as follows: (1) attempts were made to clear the urinary tract infection with sulfonamides (in a few cases streptomycin); (2) neurologic lesions were treated with physiotherapy; (3) patients with rectovaginal fistulas or third degree lacerations were placed on low residue diets and sulfaguanadine; (4) the excoriations of the vulva were treated with sitz baths three times daily and followed by the use of a dusting powder; (5) a high protein diet with vitamin supplements was maintained; and (6) intravenous pyelograms were taken.

Fundamentals of the operative procedure were: (1) a spinal anesthetic; (2) lithotomy position; (3) excision of constricting bands of fibrous tissue or the use of episiotomy in order to obtain adequate exposure; (4) the use of relaxing incisions to acquire the necessary mobility for closure; (5) approximately one-quarter inch of the vaginal epithelium around the fistula was removed (the section was carried no deeper than the epithelium); (6) the repair was carried out with a Hagedorn needle holder, a small cutting needle, and No. 00 catgut; (7) the initial layers of sutures were carried from the periphery of the denuded area deep through the vesicovaginal septum but not entering the mucosa of the bladder; (8) the first line of sutures were all placed and tied, and sterile water was then introduced into the bladder to detect any possible leak in the suture line; (9) the second layer of sutures was now introduced, beginning in the vaginal epithelium; (10) the vagina was cleaned and packed with vaseline gauze (to be removed in 3 to 5 days); and (11) a self-retaining catheter was anchored to the labia majora by a mattress suture.

Postoperative treatment was considered most essential and consisted fundamentally of (1) continuous suction to the catheter which was maintained for a period of 14 days; (2) the patient was kept on her back during the entire period of bed rest but was allowed to move about freely; (3) urinary antiseptics were maintained until the catheter was removed; (4) occupational therapy was started; (5) the catheter was removed and if the fistula was corrected the patient was discharged with proper precautions—if not, the patient was kept in the hospital on the previously outlined preoperative regimen prior to a repeat operation.

The average hospital stay was 57 days, ranging between 11 and 264 days. Seventy per cent of the

fistulas were closed on the first attempt. Two patients were considered inoperable and 5 operations were considered failures. The operative failures are described in detail. Stress incontinence was common, occurring postoperatively in 38 cases, and in all but one of these there was response to very simple measures such as a Kelly repair or simple reconstruction of the external uretheral meatus. There was one death following transplantation of the ureters into the bowel. The results were considered excellent in view of the nature and extent of the fistulas, which were usually an inch or larger in diameter.

—*James F. Donnelly, M.D.*

Analytical and Critical Study of the Value of Some of the Methods for the Diagnosis of the Anovular Cycle (Studio analitico e critico sul valore di alcune metodiche nella diagnostica dei cicli anovulari). LUIGI CUSMANO and GIAN PIERO BALASSI. *Ann. ostet. gin.*, 1955, 77: 264.

SEVEN PATIENTS, studied histologically and with reference to the hormones, form the material upon which this appreciation of study methods is based. Five of the women did not show a secretory response of the endometrium in the presence of an elevated elimination of pregnandiol in the urine, that is, ovulation did not occur; consequently there was no formation of a corpus luteum and no secretion of progesterin to produce the secretory phase of the cycle. In the remaining 2 patients there was an evident secretory transformation in the absence of detectable amounts of pregnandioluria. In 3 of the patients, in addition, there was present a more than sufficient estrogenic titer. The authors do not discuss the probable error inherent in the preovulary production of progesterone by the theca, since in their opinion such error can be avoided.

The knowledge gained by the authors from this material and from a careful study of the literature has produced a certain distrust of the method of examination. They are of the opinion that in any of the tests for the diagnosis of the anovular cycle there is a certain increment of error to be expected and that none of them can be interpreted with mathematical precision.

The authors themselves consider, on the whole, that for practical purposes it will be sufficient to make a systematic study of the catamenial function, with at least the administration of a couple of the appurtenant hormones, with a biopsy examination (aspiration biopsy or microcurretate in the presumptive secretory phase), and with daily determination of the vaginal basal temperature. With reference to the other (subsidiary) examinations, such as mucography and vaginal cytology, it is conceded that they are useful and interesting, but not yet proved to be clearly indispensable.

In conclusion there is appended a table evaluating briefly 13 of the better known tests of catamenial function. The direct tests (the finding of ova or of corpora lutea on laparotomy) are, because of the rarity of the observations, of little practical value. The clinical tests (history of the menstrual rhythm and palpation of the ovary) are of too generic a nature to be of much significance. The vaginal tests (colposcopy, colpomicroscopy, biopsy, glycogen cellular content, and *p*H) are of undeniable utility but capable of erroneous interpretations. The cervical tests (macroscopic and microscopic mucography, *p*H, and biopsy) are in the same category as the vaginal tests discussed. The endometrial tests (biopsy, glycogen cellular content) are not as practical as the corresponding vaginal and cervical tests; they are merely scientific curiosities. The myometrial tests have given contrasting and inexplicable results. The biologic tests, such as the hyperemic ovary of the mouse (Farris and Murphy), are subject to practical difficulties of operation. The potentiometric tests are not sufficiently specific and are difficult of interpretation. The spectroscopic and cycloscopic test (Samuels) is still under discussion. The thermometric tests (vaginal and rectal basal temperature controls) are of utmost significance. The tests for allergic reactivity (intradermic response to estrogen, progestin, and gonadotrophin) are of great interest, but they are under study and not yet ready for definitive evaluation.

All in all, the authors conclude that there should be no aprioristic acceptance of any of the tests in use, but that each should be supplemented by as many of the others as practicable.—*John W. Brennan, M.D.*

Significance and Pathogenesis of Hypomenorrhea (Significacion y patogenia de la hipomenorrea). M. GALBIS. *Acta gyn. obst. hisp. lus.*, 1955, 4: 256.

THE AUTHOR expresses surprise at the relative dearth of literature concerning ovarian function in hypomenorrhea. Hypomenorrhea is defined as menstrual flow of one to one and a half days in duration, or up to two days if scantiness of flow has also been noted by the patient.

Two hundred eight cases were studied. Of these, 169 were drawn from 4,000 gynecological consultations since 1949; 25 patients were seen because of sterility or endocrinologic problems, and 14 were from the gynecologic and obstetric floors. The following data were collected:

Of 4.22 per cent of consultations in gynecology, only one-fifth of the patients came in for hypomenorrhea. The menarche was normal. The types of cycles were: (1) normal cyclic in 69.7 per cent; (2) short cyclic, 9.6 per cent; (3) opsomenorrhea, 7.6 per cent; (4) irregular type, 7.6 per cent; (5) normal with amenorrheic episodes, 5.2 per cent. In only 29.5 per cent was the hypomenorrhea associated with some other determining factor, such as abortion. Upon examination, the condition of 102 patients was found to be normal; chronic adnexitis was found in 37; uterine hypoplasia in 10; cervicitis in 10; ovarian cyst in 7; syphilis in 5; genital tuberculosis in 4; cystitis in 4; colpocele in 3; pulmonary tuberculosis in 3; and miscellaneous conditions in 19.

The usual incidence of infertility in the author's clinic is 4.6 per cent. In hypomenorrheic patients with active sexual activity, the incidence is 62.2 per cent; 25.5 per cent of patients have primary sterility, 10 per cent abort, and 35 per cent have never carried to term. The incidence of abortions, in general, is higher in patients with hypomenorrhea (27.5%).

Endocrinologic study was based on endometrial biopsies taken on the first day of flow, serial colpocy-

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tologic analysis, and basal temperatures. Findings were normal in 50 per cent of the cases; ovulation was retarded, with persistence of menstrual temperature in 7.8 per cent; a moderate deficiency of ovarian function without ovulation (hypoplastic endometrium, monophasic temperature) was found in 18.4 per cent; tuberculous endometritis was present in 7.8 per cent; and there was insufficient progestational preparation of the endometrium with signs of dysfunction or primary lesions of the endometrium in 18.4 per cent of the cases.

The author concludes that hypomenorrhea has definite clinical significance and is not always the sign of dysfunction or ovarian deficiency.

In those cases with normal function, the author postulates that there is a possible return to the menstrual types of the lower primates, or that this is due to the effect of a neurocellular influx.

—*W. Newlon Tauxe, M.D.*

The Demons-Meigs Syndrome (La Sindrome di Demons-Meigs). Luigi D'Incerti Bonini and Antonio Camera. *Riv. ital gin.*, 1955, 38: 255.

The authors present a case which illustrates the rare gynecological entity known as Demons-Meigs syndrome. Consideration is given to the differential diagnosis, and the clinical and pathological characteristics, as well as to the theories that may account for the formation of the abdominal ascites (hydrops) and hydrothorax. Primarily the clinical entity is based on the triad of ovarian fibroma hydrops, and hydrothorax. About 100 cases have been reported.

The present case is that of a 51-year-old patient undergoing the usual menopausal period from 1950 to 1954, at which time she noted a gradual increase in the size of the abdomen, slight respiratory disturbances, and sluggishness of the digestive tract. Physical examination revealed a moderate right-sided hydrothorax and considerable abdominal ascites, amounting to 4 liters. Following paracentesis the fluid gradually reappeared and a gynecological consultant made the diagnosis of ovarian malignancy, in all probability with pelvic metastasis. Diuretics (aminophilline and ammonium chloride) were administered and the patient was also exposed to 7 roentgenologic treatments (4 of 100 roentgens and 3 of 150 roentgens). About one month later another gynecologist confirmed once more the diagnosis of neoplasm of the ovary, presumably malignant in nature. Surgery was decided upon and a bilateral salpingo-oophorectomy was performed. The right adnexa presented a large ovarian tumor about 12 cm. in diameter. The postoperative course was normal.

The abdominal ascites may well represent fluid secreted by the ovary itself. How this is brought about has not been satisfactorily explained by the many theories advanced. Also unknown is the exact mechanism of the formation of the hydrothorax. The clinical course is usually afebrile and removal of the tumor mass results in complete cure. The authors emphasize that the preoperative diagnosis is based on the clinical triad mentioned herein. A careful study of the history and physical findings should differentiate the syndrome of Demons-Meigs from cardiac, renal, and hepatic diseases, especially cirrhosis. Ectopic spleen can be ruled out by palpation and by a flat plate of the abdomen. Somewhat more difficult is the differentiation between ovarian fibroma and a pedunculated uterine myoma. In this latter condition, fluid formation is rare.

The authors conclude their presentation with the reminder that both ascites and hydrothorax may be found in benign as well as in malignant cysts of the ovary. In passing, brief mention is made of the possibility of including in the discussion of this syndrome the rather unlikely occurrence of cancer of the head of the pancreas and other abnormalities of this organ.

—*Vincent Ippolito, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

The Conservative Management of the Severe Toxemic Patient. A. P. Barry and M. B. Quane. *J. Obst. Gyn. Brit. Empire*, 1955, 62: 504.

It has been stated that if improved methods of inducing labor, reduction of the danger of infection, and prevention of the rapid deterioration of the toxemic patient could be obtained, the indication for abdominal delivery would be materially reduced. The use of intravenous pitocin drip and the wide spectrum of antibiotics have done much to assist in answering two of these problems.

The authors present 12 cases in which a combination of pitocin in association with hexamethonium bromide was inducted intravenously. Actually, only one case is presented in which pitocin is stated as being used intravenously; however, labor was either active or induced by rupture of the membranes in all of the cases.

The technique of administration of the hexamethonium consisted of the initial dose of 10 mgm. intramuscularly. The effect on the blood pressure was noted. The administration of 200 mgm. of hexamethonium in 500 c.c. of 5 per cent dextrose plus 10 units of hyaluronidase was then started by submammary drip at the rate of 24 drops per minute. The blood pressure was determined frequently, the rate of administration depending entirely on the blood pressure. This method is suggested as a satisfactory means of controlling acute toxemia in the patient who is in labor, or in whom labor has been induced.

—*James F. Donnelly, M.D.*

Three Cases of Removal of the Corpus Luteum During the First Trimester of Gestation. (Trois cas d'enlèvement du corps jaune durant le premier tiers de la gestation). J. Simon *Bruxelles med.*, 1955, 35: 1495.

Removal of the corpus luteum in different animals produces different consequences. In the human being, however, the problem is quite controversial. Many authors believe that removal of the corpus luteum beyond the sixtieth day of gestation will result in loss of the pregnancy. Others, however, are of the opinion that in the presence of an ovarian cyst the resulting loss of pregnancy will be the same whether the treatment is conservative or surgical. In some cases replacement therapy with progesterone, stilbestrol, and vitamin E has not produced a higher survival rate of the pregnancy. The author believes that while there is still not a certain date at which the corpus luteum can be removed without danger to the pregnancy, the first 6 weeks are the most critical to surgical intervention. He has followed 3 patients in whom, under different circumstances, the corpus luteum was removed after between 6 and 10 weeks of pregnancy.

The first patient was a 21-year-old primipara who had been operated upon during the second month of pregnancy for a cyst of about 10 cm. in diameter. Daily injections of 50 mgm. of progesterone were given for about 10 days and 25 mgm. for the next 35 days. She delivered a normal female infant at term.

The second patient was a 21 year old para III, who sought medical attention because of vaginal bleeding and backache. Examination revealed a mass of about 10 centimeters adjacent to a 6-weeks-old uterine pregnancy. The cyst was removed surgically after preparation with progesterone. Postsurgically progesterone was given for about 30 days. The patient was in her sixth month of pregnancy at the time of preparation of the present paper.

The third patient was a 36-year-old multigravida who was admitted to the hospital with a parauterine mass of about 6 centimeters. An ovarian cyst was removed surgically and the patient received daily injections of 25 mgm. of progesterone. On the fifth day the patient refused further injections and was given progesterone orally. She was 4.5 months' pregnant at the time of preparation of the present article.

It is interesting to note (1) that no patient had postoperative vaginal bleeding; (2) that the cytologic examination of the vaginal secretion was quite important to the follow-up treatment; (3) a cytologic curve was different in the first two cases than in the third case, and therefore a different type of treatment was indicated; (4) the preoperative administration of progesterone, either 75 mgm. in oil or 50 mgm., microcrystalline type, was indispensable for the normal continuation of the pregnancy.

The author concludes that surgical intervention after the sixth week of gestation may be performed with adequate substitution therapy; that cytologic examinations and hormonal dosages will indicate the condition of the pregnancy; and that the preoperative administration of progesterone is necessary in order to prevent miscarriage.

—*Robert O. Verheecke, M.D.*

Placenta Previa; a Review of 200 Cases. F. G. Grant. *J. Obst. Gyn. Brit. Empire*, 1955, 62: 497.

A series of 200 patients with placenta previa, who were admitted to the Royal Maternity Hospital, in Belfast, are reviewed. The patients are grouped, according to the position of the placenta, into four major categories. The first type includes those cases in which the placenta is primarily in the upper segment of the uterus with only the lower edge of the placenta extending into the lower segment. The second type includes those cases in which the lower edge of the placenta extends as far as the internal os. The third type includes those cases in which the placenta covers the internal os when no dilatation is present. The fourth type includes those cases in which the entire lower segment is covered by the placenta.

The average onset of hemorrhage in the first and second types, with the placenta in anterior position, was 37 weeks. In the second type, with the placenta in posterior position the average onset of hemorrhage was 36½ weeks. In the third and fourth types the average onset was 34 weeks.

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The principles of management were basically conservative, according to the technique outlined by Macafee. On admission the patients were typed, and the red cell count and hemoglobin levels were obtained, this procedure being repeated at frequent intervals. Speculum examination was performed. Soft tissue and displacement radiographic studies were done to determine the placental site and also the presence or absence of fetal abnormality. In patients admitted after the thirty-seventh week a sterile pelvic examination in the operating room was performed after the preceding studies had been carried out.

With regard to the specific types of placenta previa, type 1 was treated expectantly with the exception of those patients who were bleeding more than a minimal amount when rupture of the membranes was carried out. It is noteworthy that 13 of the 35 patients in this group were treated by cesarean section for various other obstetric causes. In the type 2 placenta previa with anterior location of the placenta, rupture of the membranes was the usual treatment selected. Again it is noteworthy that 10 of the 14 patients in this group were treated by cesarean section for other complications. When the placenta was posterior in this type the treatment depended on whether or not the head was engaged or could be made to engage. If the head was engaged or could be made to engage, artificial rupture of the membranes was the treatment of choice. If not, cesarean section was the treatment of choice. In types 3 and 4 the treatment of choice was cesarean section.

There was a gross fetal mortality of 11.9 per cent. Thirty-seven per cent of the entire group were treated by conservative measures for periods varying from 2 to 10 weeks. The fetal loss in the latter group was 16 per cent.

There were five important factors in the good results obtained by this method. The first was the cooperation of the practitioners in the area in refraining from doing pelvic examinations at home. The second was the policy of conservative treatment in those cases in which the infant was unduly premature. The third factor was the extended use of cesarean section, particularly in the major degrees of previa. The fourth factor was the increased accessibility of blood, and the fifth, the improved pediatric care rendered the infants. —*James F. Donnelly, M.D.*

Placental Metastasis from Malignant Melanoma; Report of a Case. A. Gordon Reynolds. *Obst. Gyn.*, 1955, 6: 205.

Pregnancy and malignant melanoma are seldom associated. However, when they are, the prognosis is grave.

Although the hormones of pregnancy apparently initiate the malignant change, continued growth is not dependent upon continuation of the initiating hormonal stimulus.

The hazard of transplacental metastasis from mother to fetus in utero is not great; however, it does occur. The metastatic melanoma in the placenta apparently invades the chorionic villi penetrating the intravillous space, thus becoming blood-borne via the umbilical vein to the liver. The infant has little resistance to these heterotopic cells.

The following recommendations are made:

1. Prenatal examination of every woman should include an evaluation of all pigmented moles.
2. Prophylactic removal of pigmented moles in pregnant women should be done under the following circumstances:
   a. When moles on the trunk are subjected to irritation
   b. When moles are on the genitals or feet, as in these locations they are more prone to malignant change
   c. When moles are smooth, blue or black, or dark brown
   d. When moles exhibit increased pigmentation, elevation of growth, enlargement in diameter, or are associated with ulceration, bleeding, or pain.
3. All removed moles should be subjected to microscopic study.
4. If malignant melanoma occurs during pregnancy the treatment is radical excision.
5. Young women with recently treated melanoma should be warned of the risk of future pregnancies and urged to avoid pregnancy for at least 3 to 5 years. The risk is great enough to consider sterilization.
6. Castration has no value in therapy or in the prevention of this neoplasm.
7. Once metastasis has occurred there is no value in premature interruption of the pregnancy.
8. There is danger of transplacental inoculation of the fetus but its occurrence is rare.
9. Some benign nevi undergo malignant degeneration during pregnancy. Such melanomas grow with unusual rapidity and metastasize widely. The prognosis in pregnant women with melanoma is poor and few cures are obtained.

What is thought to be the fourth reported case of a proved placental metastasis from a malignant melanoma is summarized, with current thought regarding melanoma associated with pregnancy.

—*Harry Fields, M.D.*

Basal Cell Hyperactivity of the Cervix in Pregnancy with Postpartum Follow-Up. Robert E. L. Nesbitt, Jr. *Obst. Gyn.*, 1955, 6: 239.

Pregnancy per se in the majority of patients seems to exert a definite stimulating effect upon the cervix in the direction of epithelial hyperactivity, and following pregnancy regressive changes occur in the cervix. Cases with basal-cell hyperactivity during pregnancy have a 77.4 per cent chance of reverting to normal by 6 weeks postpartum, and 94.1 per cent are normal by the sixth postpartum month. The higher degrees of hyperactivity during pregnancy show less tendency to revert to normal than does Grade 1. Sixty per cent of the cases of grade 2 and grade 3 hyperactivity in pregnancy persisting in the postpartum period reverted to lower grades by the sixth week. The patients with basal-cell hyperactivity of the cervix at the sixth postpartum week continued to show regressive changes until 6 months after delivery. During this period hyperactivity persisted (6 weeks to 6 months); only 26.3 per cent of the lesions present at 6 weeks postpartum persisted, 20 per cent of these at a lower grade. There is little tendency for regression to normal or for change in grade of hyperactivity after 6 months.

There is an apparent increase in the incidence of basal-cell hyperactivity in subsequent pregnancies according to the grade of hyperactivity in the initial pregnancy. The relationship is not sufficiently great to predict the outcome in a subsequent pregnancy with any degree of certainty in a given case. Once basal-cell hyperactivity develops during pregnancy, however, its ultimate course and behavior in a subsequent pregnancy seems to be related to the initial grade of involvement.

None of the patients with basal-cell hyperactivity in this report developed preinvasive or invasive carcinoma over the 6½-year period of the study, although basal-cell hyperactivity was persistent in 8 cases for variable lengths of time up to 30 months.

Cases that demonstrate the capacity to produce advanced hyperactive change in the cervix under the influence of pregnancy or other stimulus may well constitute the group that ultimately develops cervical cancer. For this reason the patients should be placed in a specialized clinic designed for the prolonged periodic follow-up of suspicious cases. Basal-cell hyperactivity can be generally regarded as a reversible lesion, but the importance of the small group of lesions persisting at 6 months postpartum (5.9 per cent) must be recognized. The possible role of basal-cell hyperactivity as an antecedent lesion in the life history of cancerous lesions of the cervix makes the postpartum follow-up of all cervical lesions in pregnancy mandatory even though regression occurs in the majority of cases. —*John R. Wolff, M.D.*

Poliomyelitis in Pregnancy; a 20 Year Report from Los Angeles County, California. PAULA HORN. *Obst. Gyn.*, 1955, 6: 121.

THE CASES of 325 pregnant women who contracted poliomyelitis in Los Angeles County from 1934 to 1953 have been reported. The maternal mortality was 5.2 per cent.

There was no demonstrable increase of severity or mortality of the disease in pregnant women over nonpregnant women of the same age group.

Analysis by trimesters of pregnancy showed 120 cases in the first trimester with 7 deaths, or a mortality of 5.8 per cent; 126 patients in the second trimester with 4 deaths, a mortality of 3.1 per cent; and 79 cases in the third trimester (including postpartums) with 6 deaths, or a mortality of 7.5 per cent.

Fatality in patients with poliomyelitis occurs in cases in which the function of the respirator is involved, and depends primarily upon the severity of the disease. Related factors in avoiding fatality, however, may be the proper therapeutic management of the poliomyelitis and possibly the prompt termination of pregnancy in the third trimester. A critically ill patient with bulbar spinal poliomyelitis may have a fatal outcome regardless of pregnancy or trimester of pregnancy. The fact of pregnancy adds considerably to the therapeutic burden, especially in the third trimester. Protein, electrolyte, and fluid balance must be carefully observed; respiratory obstruction, infection, and the threat of toxemia are ever present problems.

Pregnancy is not terminated except for obstetric indications, with the exception of a few cases of acute, severe, progressive bulbar spinal disease occurring 4 to 6 weeks prior to term, in which respirator assistance and tracheotomy are indicated. In 10 such instances rapid termination of the pregnancy by cesarean section has been done without resultant maternal or fetal loss incident to surgery.

Once a patient has become stabilized to respirator care, spontaneous onset of labor and vaginal delivery are anticipated. The management of labor and delivery in the respirator has been outlined in detail.

The ventilation meter developed by Bennett is helpful in determining a patient's need for respirator assistance and the ultimate prognosis.

Ventilation studies in a series of 32 normal healthy women throughout pregnancy and 6 weeks postpartum revealed a pattern of decreased vital capacity toward term and an increased postpartum in 17 women. In an occasional instance there was a steady downward trend toward term, and such a patient conceivably could be helped by termination of her pregnancy, should she develop bulbar spinal poliomyelitis.

Poliomyelitis per se without respiratory involvement, even with four-extremity paralysis, is not an indication for cesarean section. In our present knowledge and experience, termination of a pregnancy is not indicated before the period of viability of the infant.

Poliomyelitis occurs somewhat more frequently but apparently is no more severe or fatal in the pregnant adult female than in the nonpregnant one. Early diagnosis of poliomyelitis in pregnancy is difficult because its prodromal symptoms are similar to the frequent minor discomforts of pregnancy. Proper care and rest early in the disease, with early diagnosis, are most important and may forestall severe forms of poliomyelitis.

Poliomyelitis, even mild nonparalytic types, may produce abortion, especially early in the first trimester. There were 43 known abortions among 325 cases of poliomyelitis, or 13 per cent. Maternal anoxia will produce intrauterine fetal death, especially in the second trimester, with delivery of macerated stillborn infants.

The infants of mothers who developed poliomyelitis early in pregnancy tended to be subnormal in weight at term, especially in respirator patients.

The occurrence of 2 infants with cardiac defects whose mothers had poliomyelitis at 6 to 7 and 22 weeks of pregnancy, respectively, is not sufficient to lend credence to the supposition of viral damage to the fetus in the first trimester of pregnancy, as noted in rubella.

There is no evidence of intrauterine transplacental transmission of the poliomyelitic virus. None of the infants developed poliomyelitis.

In mothers who are critically ill with rapidly progressive bulbar spinal poliomyelitis with paralysis, and who need respirator care and tracheotomy, the interest of the viable infant after the thirty-second week of pregnancy is best served by rapid termination of the pregnancy by cesarean section. Maternal respiratory difficulties with obstruction and infection leading to insufficient oxygenation of the fetus *in utero* tend to cause intrauterine fetal death. It is our growing con-

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viction that if an estimation of a 4 pound fetal weight can be determined, the baby will have a better opportunity for survival out of its maternal environment. Postmortem section usually does not save the baby.

There appears to be no relation between the sex of the infant and trimester of pregnancy in maternal poliomyelitis as postulated by Aycock.

Careful study of the 26 substandard-weight infants may provide clues to the effects of maternal poliomyelitis on the infant *in utero*. —*Harry Fields, M.D.*

The Evaluation of Perinatal Deaths. PETER GRUENWALD. *Obst. Gyn.*, 1955, 6: 471.

THE COMMON pathologic findings in the perinatal period include three groups which present problems of interpretation and statistical evaluation: perinatal distress, prematurity, and mononuclear pneumonia. Findings indicative of perinatal distress usually do not reveal the cause of distress. The cause may be disclosed by the history in some of the cases and in the others it remains unknown. Prematurity may contribute more or less prominently to an infant's death, but its role is not strictly comparable to a disease process. It is, therefore, desirable to evaluate findings separately by weight or gestational age groups, in order to avoid weighing prematurity against perinatal distress or other disease. Mononuclear pneumonia is a common finding, and often the only one, at autopsy in infants older than one week. Its cause is unknown, as is the extent to which the disease characterized by this lesion contributes to death in many instances.

In the statistical evaluation of perinatal deaths it is essential to choose the categories of classification so that they are mutually exclusive. It is equally important not to mix information obtained at autopsy with data from the history since they are of different significance and may overlap. —*Alan Rubin, M.D.*

LABOR AND ITS COMPLICATIONS

Studies in Placental Action During Prolonged and Dysfunctional Labors Using Radioactive Sodium. TREVOR JOHNSON and C. G. CLAYTON. *J. Obst. Gyn. Brit. Empire*, 1955, 62: 513.

FETAL LOSS associated with prolonged labor is still extremely high in spite of all modern therapeutic agents. The usual cause of the fetal death is ascribed to intrauterine asphyxia which may be due to a disturbance in normal placental function.

In view of a marked improvement in fetal survival rates obtained in prolonged labor when managed under continuous caudal analgesia, it seemed conceivable that some improvement in placental blood flow might be responsible. For this reason radioactive sodium was used in an effort to determine whether or not there was interference with placental function in cases of abnormal labor. The use of this technique is based upon the assumption that the diffusion rates of sodium from the mother to the fetus truly reflect placental behavior. Isotonic saline labelled Na_{24} was given intravenously and used as a measurement of placental function. Two methods were used: first, the total quantity of radiosodium transferred to the fetus in a given time was compared with the maternal radiosodium level; secondly, the ratio of plasma radiosodium concentration in the umbilical vein was compared with that in the maternal vein at the moment of delivery.

In 98 normal pregnancies a consistent range of values for the placental transfer of radiosodium was obtained. In labors complicated by placental ischemia for one reason or another the values were found to be extremely low, at times ranging as low as 50 per cent of the normal mean value. Prolonged labor under continuous caudal analgesia, however, resulted in radiosodium transfer in the near normal range.

—*James F. Donnelly, M.D.*

Placenta Accreta; an Analysis Based on an Unusual Case. BENGT MEYER. *Acta obst. gyn. scand.*, 1955, 34: 189.

A CASE is presented in which a full-time placenta had adhered to the intramural and isthmic portion of the tube. Histologically, it resembled an intrauterine placenta accreta with its connective tissue septa. It was not removed until 9 months after the child had been delivered by cesarean section. The patient had puerperal and menstrual disturbances attributable to the hormonal activity of the placenta. No similar case has previously been described in the literature, to the best of the author's knowledge.

—*Charles Baron, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Urolithiasis in the Light of 3,340 Observed Cases (Die Steinkrankheit im Lichte von 3,340 beobachteten Faellen). J. MATES and V. KRIZEK. *Zschr. Urol.*, 1955, 48: 478.

THE HEALTH LAW of 1948 in Czechoslovakia, making available the bath treatments at Marienbad to those urologic sufferers who previously would not possess the means for such treatment, has resulted in the opportunity of studying an unusually large number of such sufferers. Most of the patients were afflicted with nephrolithiasis and ureterolithiasis (totaling 3,300 cases). Predominant in the matter of vocation were the sedentary occupations of the males and the housework of the females.

Although there were more men than women in this material (64.3 per cent of males), more women than men were afflicted with phosphate stones (33.85 per cent to 33.29 per cent) and with the so-called coral stones (39.55 per cent to 35.46 per cent).

On the whole, the most frequently encountered calculus was the oxalate stone, in 42.3 per cent, and in these cases the male predominated (34.04 per cent to 32.85 per cent). Next in frequency was the urate stone, in 29.3 per cent, with 39.93 per cent in males and 37.90 per cent in females, then the mixed composition stones, with 35.9 per cent in males and 33.32 per cent in females, and, finally, the phosphate and carbonate stones (14.1 per cent).

Little could be determined with reference to the age level of the material as a whole and as to the sexes in particular. With reference to the matter of heredity, however, an uncommonly high incidence of urinary stones in the antecedents and collaterals of the patients (12.5 per cent) was found.

The patients were carefully questioned with reference to antecedent infectious and metabolic diseases, and a marked incidence of constipation and of dyspeptic disturbances with frequent complaints of meteorism was revealed. In fact, the examinations of the gastric secretions disclosed abnormal curves (hyper-acidity or hypoacidity) in a fourth of all cases. In only 1 instance were the authors able to elicit a history of an antecedent glomerulonephritis; nephrosis or glomerulonephritis with a nephrotic syndrome was in no instance uncovered. The impression was obtained that in this material the stone and the cited kidney infections were mutually exclusive. Evidence of secondary infection, due to the presence of the stone, was not uncommon. Of the metabolic affections, the only condition actually found seemed to be diabetes (13 diabetics).

Clinically, the stone was found on the left side in 36.5 per cent of the cases, on the right in 33.0 per cent, bilaterally in 14.5 per cent, and undetermined in 16 per cent. Bilaterality was encountered most frequently among the coral stones (48 per cent) and among the phosphate stones (23 per cent). In 52.5 per cent of the instances the stone was located in the renal pelvis, in 10.2 per cent in the calyces, in 33.0 per cent in the ureter, and in only 1 per cent in the urinary bladder (in association with nephrolithiasis).

The laboratory studies, the bacteriologic findings in the urine, the constitutional studies of the patients, the results of operation, and the incidence of recurrence will be discussed in other publications.

—John W. Brennan, M.D.

The Action of BAL, British Anti Lewisite, in Sublimate Poisoning (Sull'azione del BAL, British Anti Lewisite, nell'avvelenamento da sublimato). A. GIBBA. *Arch. ital. urol.*, 1955, 28: 149.

TWENTY-FOUR ADULT MALE RABBITS were used in this experimental study. These animals were placed in pairs, one to be injected with the mercury salt and the BAL, and the other (control animal) to be solely injected with the mercurial poison. After the lapse of 6 hours the BAL injection was repeated in the experimental animal, the control being left without further treatment. This procedure was repeated every 6 hours for a total of 36 hours; then the BAL injections were given after elapsed period of 12 hours. The first pair was sacrificed at the end of 6 hours and each pair successively thereafter. The last remaining control died spontaneously after 74 hours and its partner was then sacrificed at that time. All of the kidneys thus procured in pairs during successive stages of the action of the sublimate and, eventually, of the BAL, were subjected to microscopic study.

A series of 12 photomicrographic reproductions in the original articles show the inevitably progressing stages of the classic mercurial poisoning of the kidney and the surprising degree of protection of the kidney tissues afforded by the BAL injections. It was observed that the cloudy swelling and necrosis of the tubular epithelium do not go on to utter disorganization of the structures and inevitable death of the animal, as in the control animals, but after an initial mild cloudy swelling of the tubular epithelium (without evident involvement of the nuclei of the cells) the process under the treatment with BAL seems to become stationary or even regresses.

The author found that the portion of the tubule which was chiefly involved in mercurial poisoning was that proximal to the convoluted tubules. He recognized that this finding was at variance with that of other workers who have reported the chief point of action of the mercurial salts to be the distal portion of the tubule. However, without wishing to engage in argument, he believes that this discrepancy may be explained on the basis of variations in the techniques used by the various workers. In the author's material the convoluted tubules were also somewhat involved in the process of cloudy swelling, but this process did not have any apparent effect on the results obtained.

The author concludes, therefore, on the basis of his experience and results obtained, that he has demonstrated a protective action by BAL in the presence of mercurial poisoning of the kidney.

—John W. Brennan, M.D.

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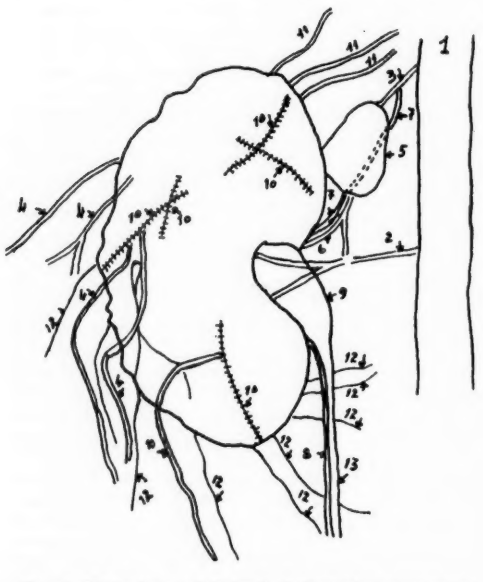

FIG. 1 (D'Amico and Saitta). *1*, Posterior vena cava; *2*, section of renal vein obliterated by thrombus; *3*, adrenal vein; *4*, anterior capsular veins communicating with the lumbar veins; *5*, adrenal capsule; *6*, tributary collateral vein to the adrenal gland; *7*, tributary vein to the adrenal gland; *8*, ureteral vein; *9*, renal pelvis; *10*, cicatricial depressions; *11*, venule communicating with the inferior "freniche"; *12*, venule to the perirenal adipose capsule; *13*, ureter.

Experimental Research with Reference to the Effects of Interruption of the Renal Vein; Anatomopathologic Study (Ricerche spermentali sugli effetti della interruzione della vena renale. Studio anatomo-patologico). GIOVANNI D'AMICO and EMILIO SAITTA. *Arch. ital. urol.*, 1955, 28: 97.

TWENTY-FOUR DOGS were used in this study; they were divided into 4 groups of 6 animals each. The kidney of each animal was exposed through a lumbar incision, exteriorized, and completely isolated from its fat capsule. The renal vein was then divided between 2 ligatures.

In the first group the opposite kidney was removed 15 days before the interruption of the renal vein. In the second, third, and fourth groups the opposite kidney was removed, 15, 30, and 60 days, respectively, after the interruption of the renal vein. All of the animals in the first group recovered perfectly from the first operation, the nephrectomy; and all in the other groups, from the phlebectomy.

With the exception of one animal, all the dogs in the first, second, and third groups died within 3 to 6 days following the second operation, all showing symptoms of renal deficiency. The "exception" lingered with signs of renal insufficiency, became anuric on the twenty-third day, and died on the twenty-fifth day after operation. Anatomopathologically, all of these animals showed the usual picture of the acutely congested kidney (a swollen, red organ with congestion of the glomeruli, cloudy swelling of the tubular epithelium, and interstitial hemorrhages); the "exception" gave an appearance more advanced toward sclerosis and contraction.

In the fourth group, that is, the dogs in which the kidney with the ligated renal vein was given 2 months to recuperate before the healthy kidney on the other side was removed, 3 of the animals died—like those in the 3 other groups, with acute renal insufficiencies. However, the other 3 animals survived; 2 were sacrificed 80 and 160 days, respectively, following the second operation (removal of opposite kidney). The remaining dog lived for 14 months following the nephrectomy.

An autopsy was carried out on all of these dogs and the condition of the kidney and of the surrounding vessels and tissues was studied. All the organs exhibited areas of sclerosis and contraction alternating with areas of fairly normal-appearing tubular and glomerular structures. The organ of the animal which survived for 14 months exhibited a rather plentiful supply of new-formed venous blood vessels (Fig. 1). These vessels emerged both from the convex and from the hilar regions of the organ, passing to the region of the suprarenal cortex and the lumbar region. One of these new-formed veins passed directly to the vena cava inferior.

From these experiences the authors conclude that if a sufficient length of time is allowed for recuperation of the kidney following interruption of its renal vein, the normal kidney on the other side may be removed and the animal will survive.

—*John W. Brennan, M.D.*

Subphrenic Versus Perinephric Abscess; Anatomic Considerations, Diagnosis and Treatment. EDWARD W. BEACH and JAMES C. TYNAN. *J. Urol.*, Balt., 1955, 74: 278.

THIS DISCUSSION of subphrenic versus perinephric abscess is preceded by an anatomic description of the subphrenic space, which is divided into suprahepatic and subhepatic spaces and the perinephric space. The authors point out that differential diagnosis between subhepatic and perinephric abscess may be difficult or impossible; nevertheless, proper therapy requires that such distinction be made. In both subhepatic and perinephric abscess the onset of illness is usually gradual, insidious, and characterized by "failing" with persistent loss of weight. Sepsis soon develops, but at the outset examination of the abdomen and loins yields negative findings. Thoracic symptoms may indicate disease of the thorax; flexion and abduction of the leg may result in suspicion of disease of the hip.

In both instances an anteroposterior x-ray film may disclose evidence of lumbar scoliosis with the concavity away from the affected side and ipsilateral obfuscation of the psoas muscle. Elevation of the diaphragm and renal fixation may occur in both conditions. Previous furunculosis or cutaneous infection is presumptive evidence of perinephric abscess, whereas previous intra-abdominal disease is presumptive evidence of subhepatic abscess.

The authors advise that surgical therapy be delayed for 2 to 3 weeks after the development of sepsis. By this time a mass will appear, point in the hypogastrium, epigastrium, or loin, and indicate the proper approach for drainage.

—*Laurence F. Greene, M.D.*

Malignant Lymphomatosis of the Kidneys. R. A. WENTZELL and S. W. BERKHEISER. *J. Urol.*, Balt., 1955, 74: 177.

IN 1,047 CONSECUTIVE autopsies, the authors found 32 cases of malignant lymphoma, and 53 per cent of these showed renal involvement. In 50 to 100 per cent of cases of lymphoma and leukemia other than reticulum cell sarcoma and Hodgkin's granuloma, renal involvement was present; among the cases of reticulum cell sarcoma there was involvement in 16 per cent, and among the Hodgkin's sarcomas, in 20 per cent. Primary renal lymphomatosis has never been demonstrated. Any patient with slowly progressive renal failure, not easily explainable, should be suspected of having malignant lymphomatosis involving the kidneys or ureters. The renal failure may be due to infiltration of intertubular and periglomular tissues with lymphoma cells and resultant pressure degeneration and atrophy. Ureteral obstruction by retroperitoneal masses without tumor invasion of the kidneys may occur.

Therapy which prolongs life and makes the patient more comfortable is available. This includes irradiation, treatment with nitrogen mustards and triethylene melamine (TEM), as well as aminopterin and a-methopterin, 6-mercaptopurine, corticotropin, cortisone, urethane, myleran, and radioactive phosphorus (P^{32}). Combined therapy is quite promising.

—*David Rosenbloom, M.D.*

Pavement-Celled Carcinoma of the Renal Pelvis (Plattenepithelkarzinom des Nierebeckens). A. HEIDENBLUT. *Fortsch. Roentgenstrahl.*, 1955, 83: 95.

THE AUTHOR'S PATIENT was a 68 year old male whose brother had died at the age of 54 years of intestinal cancer. The symptoms had been of noticeable intensity for about 6 months and had consisted of lower back pains, dysuria, pollakiuria, with cloudy and, at times, bloody urine and, eventually, loss of body weight (10 to 12 kgm.). The first retrograde pyelographic examination disclosed a normal upper renal pole, the neck of the middle calyx was markedly narrowed, and the calyx itself somewhat dilated. The group of calyces composing those of the lower renal pole were practically obliterated with vague, in places moth-eaten, borders.

Because of the presence of an old tuberculous process in the left upper lobe of the lung field, the renal lesion was considered most likely to be a sclerotic contracting tuberculous process of the lower pole of the kidney.

A second retrograde pyelographic examination 6 weeks later evidenced a complete filling defect of the caudal group of calyces, a couple of questionable cavities at the branching off of the lower main calyx from the renal pelvis, and dilatation and cranial displacement of the middle calyx. There was now added to the possible diagnosis of tuberculosis, also that of a renal tumor taking origin from the kidney parenchyma and compressing the calyceal system of the renal pelvis.

The kidney was removed and the microscopic examination uncovered in the constricted area a polystratified pavement epithelium with evident signs of immaturity. The epithelial strands were densely crowded together and irregularly distributed. The nuclei were relatively quite large and exhibited numerous mitotic figures in some areas.

This epithelial component had invaded the collecting tubules of the kidney parenchyma and frequently filled their entire lumen. In the region of the larger arteries in the margin between the medullary and cortical areas the cancerous tissue had grown into the perivascular lymphatic vessels. In the cortical region were encountered extensive areas of necrosis, interspersed with normally preserved areas, and here the capillaries were invaded and, in places, even the glomeruli.

The diagnosis was keratinizing pavement-celled carcinoma of the renal pelvis with systematized invasion of the urinary tubules, blood capillaries, and larger arterial branches. About 143 of these rare tumors have so far been reported.

—*John W. Brennan, M.D.*

A Case of Papillary Pavement-Celled Carcinoma of the Renal Pelvis (Ein Fall von papillaerem Plattenepithelkarzinom des Nierenbeckens). W. KÖNNINGER. *Fortsch. Roentgenstrahl.*, 1955, 83: 100.

THE AUTHOR'S PATIENT was a 67 year old male who had never been seriously ill. A massive attack of hematuria led to examination. A retrograde pyelogram disclosed normal filling of the right ureter and renal pelvis, while on the left side there was a good filling to the level of the third lumbar vertebra, the point which should correspond to the entrance of the left ureter into the pelvis. Eventually the point of emission from the left renal pelvis appeared to be dilated and irregularly contoured. The rest of the left renal pelvis, even following the intravenous administration of avacan (a spasmolytic preparation), could not be visualized.

At operation there was uncovered a large, nodular kidney which was not adherent to the surrounding structures. The wound healing following the nephrectomy was without incident and the patient was later discharged from the hospital in excellent physical condition.

The macroscopic examination of the removed specimen disclosed a rather marked thickening of the mucosa of the renal pelvis which in places exhibited irregular papillary outgrowths; these outgrowths were evident also in the region of the calyces.

The microscopic examination disclosed a typical, in places papillary, pavement-celled carcinoma which extended outward into the kidney parenchyma. In many places the tumor tissue had invaded the lymph vessels, in general preferring the periarterial lymph vessels of the larger arteries. Inflammatory and degenerative manifestations of the condition were observable only in the renal parenchyma which had been infiltrated by the tumor tissue.

—*John W. Brennan, M.D.*

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Reflex Inhibition of Diuresis in the Contralateral Kidney in Instances of Nephrectomy; Clinical Manifestations, Pathogenesis, Treatment (Reflektorische Diuresehemmung der kontralateralen Niere bei der Nephrektomie; Klinik, Pathogenese, Therapie). PAUL MELLIN and HANS-JÜRGEN FRANK-SCHMIDT. *Zschr. Urol.*, 1955, 48: 465.

THE CASES of 5 nephrectomized patients who gave evidence of faulty functioning of the residual kidney are reported.

The first case was that of a 25 year old young woman who was nephrectomized under light evipan narcosis. Ten minutes after institution of the anesthesia a curare-like preparation [triiodo ethylate of tri(diethyl-amonoethoxy) 1, 2, 3 benzol], with artificial respiration by intubation, was administered. The light narcosis was maintained with nitrous oxide and oxygen in the ratio of 1 to 1; during the muscle and skin suturing the nitrous oxide was increased to a ration of 4 to 1.

The operative course ran smoothly, yet an hour after the administration of the relaxant there was still no evidence of spontaneous respiratory movements. Lobelin was without result and artificial respiration had to be administered. Prostigmin and atropine finally produced a superficial, irregular manifestation of respiratory movements. Under these two drugs spontaneous respiration was gradually resumed and muscular movement was regained in the extremities. The "curare physiognomy" persisted until the following day.

Since the relaxant is excreted through the kidney, insufficiency of the residual kidney was suspected and careful urinary measurements revealed a transitory inhibition of the organ. The incident is explained on the basis of a reflex inhibition of the urinary secreting function of the residual kidney. The reflex impulse was furnished by the clamping of the pedicle of the kidney to be removed under too light anesthesia.

Cases 2, 3, and 4 were of much the same character as the first and will not need detailed reporting.

Case 4 presented some further peculiarities. The patient was a 43 year old woman with some evidence of vegetative dystonia (extrasystoles and tremor of the hands). The left kidney was removed on account of a stone after intubation narcosis with evipan, pantolax and curaroid. Light anesthesia was maintained with nitrous oxide and oxygen. Immediately after the renal pedicle was cut the patient suffered a circulatory collapse. After 2 hours of administering physiologic saline solution, blood transfusion, and cardiotonics under oxygen, the pulse became palpable but the blood pressure could not be measured. The patient had begun to breath spontaneously at the time the pedicle was cut (the curare had already been excreted) and thus the relaxant could not be blamed for the condition. The kidney, however, was not functioning effectively and on the third day after the nephrectomy uremic symptoms appeared. Paravertebral novocain injection (D 10 to L1) was without success, the patient dying in a clonic convulsive attack.

The most striking macroscopic autopsy finding was an extensive hematoma in the retroperitoneal tissues on the left side, that is, the side from which the kidney had been removed. The microscopic examination of the residual kidney disclosed an anemic condition of the cortex, hyperemia of the medulla, and extensive blocking of the excretory ducts by coarse granular cylinders, in part hyalin in constitution and in part composed of the so-called chromoproteinuria of Zollinger. In fact, the findings were quite similar to those of the so-called "crush-kidney" of Trueta; that is, the findings were those of a reflex disturbance of the renal blood supply.

With reference to the pathogenesis, the authors postulate that the anuric condition is due to a reflex effect of the grasping and crushing of the renal pedicle, with the resulting renal cortical anemia (Boeminghaus: *Deut. Zschr. Chir.*, 1929, 214: 406). Perhaps the condition was aggravated by the retroperitoneal hemorrhage, a condition which was also present in Boeminghaus' patient.

With reference to treatment, the authors state that the reflex anuria here discussed should be avoidable. The anesthesia should be deep enough during the attack on the vegetative nervous plexus in the renal pedicle to prevent a renal reflex, the operation itself should be carried out with the least possible roughness, and the development of hematoma in the region of the plexus should be prevented.

—*John W. Brennan, M.D.*

Uncrossing the Ureter and Artery in Certain Cases of Hydronephrosis Produced by Abnormal Renal Vessels (Le décroisement de l'uretère et de l'artère dans certaines hydronéphroses par artère anormale). LOUIS MICHON and JACQUES MICHON. *Acta urol. belg.*, 1955, 23: 216.

ALTHOUGH THE ROLE played by abnormal renal vessels in the production of hydronephrosis is frequently exaggerated, in a certain number of cases such vessels have a definite relationship to this condition. The authors have had a number of successful results from resection of the abnormal renal artery causing hydronephrosis, but the defunctionalization of a large renal vessel supplying a relatively large portion of the kidney may be dangerous. In one case the removal of an important renal vessel responsible for the production of hydronephrosis caused an infarct of the kidney, which necessitated a secondary nephrectomy because of grave hematuria.

During the past year the authors have encountered 3 cases of hydronephrosis in which the resection of an important renal artery seemed to them a dangerous operative procedure. Although Marion and Perard as well as Convelaire have advised partial resection of a kidney supplied by a vessel causing obstructive hydronephrosis and have done this operation with success, the authors prefer to conserve all of the renal parenchyma by decrossing the ureter and the obstructing vessel that is producing the hydronephrosis.

Urography and retrograde ureteropyelography may suggest the presence of a renal vessel as the cause for the hydronephrosis, but it is only after careful exploratory surgical examination that the true role of the abnormal renal artery in the production of pelvic obstruction can be determined.

The incision for this operation is made over the twelfth rib, with prolongation of the incision and even resection of the twelfth rib if it becomes necessary to have more operative exposure. Careful dissection and

exposure of the ureteropelvic junction demonstrates the presence of an abnormally placed renal vessel. Its genesis in the production of hydronephrosis must then be evaluated. In some cases an anomalous renal vessel does not contribute to the production of a hydronephrosis for there may be a ureteral stricture that causes the obstruction. Even a branching of the vessels may not cause hydronephrosis. If an abnormal vessel is suspected, freeing of the vascular cord and elevating it may bring relief from the obstruction. It may readily be demonstrated when the vessel is obstructive in nature. It is important to determine the caliber of the renal vessel and the amount of renal tissue it supplies before it is severed. This can readily be done by temporary clamping of the vessel and determination of the amount of kidney parenchyma involved. If the vessel causes the hydronephrosis and supplies a good portion of the renal substance as shown by its large caliber, "decrossing," or uncrossing, of the ureter and the abnormal renal vessel is the operation of choice.

After a careful dissection of the ureteropelvic region, the pelvis is resected in a circular line 15 to 20 mm. in diameter. The remaining cuff of the pelvis, the ureteropelvic junction and the upper portion of the ureter are released from their attachments and decrossed from the abnormally placed renal vessel.

Before the pelvis is reanastomosed to the remaining portion of the pelvis attached to the kidney, the caliber and permeability of the ureter are investigated in order not to overlook a narrowing or stricture at the ureteropelvic junction. After it is certain that the ureter is permeable, the pyelopelvic anastomosis is made at the most dependant portion of the pelvis. The anastomosis is done with No. 000 catgut and reinforcing sutures are placed as necessary. The kidney is suspended in a high position by performing a nephropexy and the lower pole of the kidney is fixed in position with fat pads in order to maintain a position of the kidney that will insure good pelvic drainage.

The renal fossa is always drained with a rubber drain. There is some seepage of fluid for a few days after the operation but it soon disappears. The described technique was used in 2 cases, and in one case it was used with a slight modification.

From their experience with 3 cases, the authors concluded that if a large vessel supplying a considerable portion of the kidney is the cause of obstructive hydronephrosis, it is advisable not to sever it. They propose a plastic operation on the renal pelvis followed by a pyelopelvic anastomosis, instead of cutting the ureter, provided no pyeloureteral narrowing is present. —*Conrad A. Kuehn, M.D.*

Aortography and the Pathological Condition Observed at the Ureteropelvic Junction (Aortographie et pathologie de la jonction pyélo-urétérale). P. Macquet, L. Wemeau, G. Defrance, and G. Lemaitre. *Acta. urol. belg.*, 1955, 23: 208.

Bernard Fey has written that plastic surgical repair of the excretory passages of the kidney is the order of the day. To this end the authors have made a study of the genesis of physiopathological condition producing the dysfunction at the ureteropelvic junction. Abnormalities were found on radiological and surgical investigations. Each condition responsible for the dysfunction was identified and a surgical procedure that would seem the logical means of correction was applied. The patients having these surgical procedures were followed up for a prolonged period to confirm or deny the correctness of the diagnosis.

The authors combined aortography with aortourography or retrograde ureteropyelography in order to visualize the vascular tree around the ureteropelvic junction, and provided valuable information as to the actual condition in this area prior to surgery.

A preliminary urogram was made with the aortogram superimposed upon the same film. The aortogram could also be combined with retrograde pyelograms. At first the studies of the upper urinary tract were not always good, but when the technique was modified the vascular tree was well visualized. The aortograms were obtained by retrograde catheterization of the femoral artery. In this way the effect of motion was eliminated and successive injections could be obtained.

The catheter is advanced in the aorta until the estimated location of the kidney vessels is reached. A preliminary film is taken after the injection of 5 c.c. of the contrast media. The location of the catheter is checked and the height is adjusted prior to the second injection of contrast media (15 cm. of 70% diodone). The second roentgenogram shows the renal vessels and their branches.

The catheter is then withdrawn 7 to 8 cm. and a third injection is made. The third roentgenogram will show the lower portion of the aorta and the iliac vessels. A simultaneous injection through a ureteral catheter previously inserted to the proper position is made and a roentgenogram is taken at the precise moment to obtain the combined aortogram and ureteropyelogram.

By this method the presence or absence of a vascular anomaly at the ureteropelvic junction causing disease in this area can be determined. The relationship of anomalous vessels to other agents responsible for pyelectasis and hydronephrosis, such as stenosis (congenital or acquired) at the ureteropelvic junction, hypertrophy of the sphincter, or the presence of periureteritis causing constriction at the ureteropelvic junction can also be investigated.

When the information as to the condition at the ureteropelvic junction has been obtained, the proper operative procedure can be applied.

The first patient had an inferior polar artery that was demonstrated by the use of the described method. The artery was obstructive in nature and it was determined prior to surgery to be the cause of the obstruction at the ureteropelvic junction. It was sectioned and the patient was relieved of the hydronephrosis.

The second case used for illustration was found by aortography and urography to have not a polar, but a duplication of the renal artery. The two arteries were of the same caliber and each vascularized the same amount of renal parenchyma. Because of this, the renal vessels were not severed but the kidney was suspended high and in an oblique manner so as to provide adequate drainage from the pelvis when the pressure from the large calibered vessels was released.

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When the aortography does not reveal the vessels to be the actual cause of the obstruction, then the severance of the arteries is not necessary and a ureteropyeloplasty is indicated.

In some cases the roentgenological examination reveals the total absence of abnormal vessels which cause the ureteropelvic dysfunction. This fact can be confirmed at operation.

This procedure may, however, fail to reveal a branch artery coming directly from the aorta that may be the cause for the pyelectasis.

Aortography in conjunction with aortourography or with retrograde pyelography provides valuable preoperative information concerning the cause of ureteropelvic obstruction. —*Conrad A. Kuehn, M.D.*

BLADDER, URETHRA, AND PENIS

Treatment of Growths of the Bladder: Diathermy Followed by Intravesical Radium. A. R. C. HIGHAM. *Brit. J. Urol.*, 1955, 27: 211.

THE AUTHOR advises diathermic excision of infiltrating vesical neoplasms with the application of a radium plaque to the crater. The plaque is composed of needles, 5 mgm. of radium in 10 mm. active length, with 18 to 20 mm. total length, and 0.6 mm. platinum screening. The needles are placed between layers of adhesive rubber 1 mm. thick, in a pattern designed to give isodose curves.

Therapy is carried out through a suprapubic cystostomy wound. The neoplasm is excised by diathermy and the exact size of the resulting ulcer is measured. A plaque of suitable size is applied to the ulcer and is maintained in place either by suture or inertia. A long silk ligature is passed around the plaque, and, after establishment of perineal urethrostomy, the ligature is led out through the perineum. A Foley bag of 100 c.c. capacity is employed to distend the bladder; the latter is drained by a catheter with additional side holes. The bag is filled with 75 to 100 c.c. of Bonney's blue and the ends of the catheters are drawn through the urethrostomy wound. The bladder and abdominal wall are closed without drainage. Six days later the patient is anesthetized with pentothal sodium and the plaque, bag, and catheter are removed through the urethrostomy wound.

During the 4-year period from 1951 to 1954 inclusive, the author treated 46 patients in this manner. Thirty-nine per cent of patients were dead at the time of his report; recurrence of neoplasm was not noted. —*Laurence F. Greene, M.D.*

GENITAL ORGANS

Further Experience with Transrectal Biopsy of the Prostate. HARRY GRABSTALD. *J. Urol.*, Balt., 1955, 74: 211.

THE AUTHOR reports his results in 51 consecutive cases in which formal transrectal biopsy of the prostate has been performed. This technique has been especially useful in the diagnosis of carcinoma in the inoperable prostate, because the very nature of the approach lends itself to ready access to the posterior lamella. Only 41 per cent of the "clinically hard" prostate revealed carcinoma, and 41 per cent of the others, which were "suspicious" for carcinoma, had nonspecific and granulomatous prostatitis, tuberculosis, and benign hyperplasia; also, there were single instances of squamous metaplasia and calcinosis with foreign body reaction.

Every hard and "suspicious" nodule is not carcinoma, and castration or radical prostatectomy should not be performed without positive biopsy evidence of carcinoma. One out of 3 cases in Grabstald's series of proved carcinoma was "operable" according to Goodwin's criteria. Transrectal biopsy was repeatedly positive while perineal punch biopsy and transurethral resection were occasionally negative for carcinoma. In no instance was a negative transrectal biopsy ever followed by positive tissue diagnosis when later surgery was performed. Much larger fragments are obtained by transrectal biopsy than with the perineal punch technique.

The complications of the procedure include mild hematuria, perforation of the urethra (with no permanent complications), retention, and mild infection. The authors repeatedly emphasize, however, that the treatment for early potentially curable carcinoma is perineal exposure, frozen section, and radical perineal prostatectomy where indicated.

—*David Rosenbloom, M.D.*

The Transperineal Biopsy Excision of the Prostate Gland: Prostatic Biopsy (Die transperineale Probeexzision der Vorsteherdruese: Prostatabiopsie). KARL M. BAUER. *Medizinische*, 1955, p. 1129.

FIFTY PATIENTS in whom a prostatic neoplasm was suspected were subjected to transperineal biopsy excision of the prostatic gland, which was followed at a brief interval by transurethral electroresection of the neck of the bladder. In this material the biopsy procedure disclosed 20 instances of cancer of the prostate, and in this same series electroresection uncovered the cancer in 20 instances.

The so-called punch cannula is illustrated in the original article. Under brief intravenous anesthesia the cannula is inserted through the skin of the perineum 1 or 2 fingerbreadths from the midline about a third of the distance from the anus to the root of the scrotum, and is carried to the prostate under the guidance of the finger inserted into the rectum. When within the tissues of the prostate the mandrel is withdrawn and the eye of the cannula, which is facing posteriorly against the parenchymatous tissues of the gland, is pressed firmly backward against the prostatic tissues. Then the mandrel (cutting mandrel) is pushed home, to slice off the specimen which intrudes into the lumen of the mandrel.

The earliest diagnosis of the greatest number of neoplasms is, however, not the only advantage of this method of examination; there are advantages to be considered in the matter of treatment of the so-called benign prostatic adenoma. Staehler, the author's superior, has concluded on the basis of the researches of Geissendörfer and Reischauer that a heterohormonal morphogenesis of the so-called prostatic hypertrophy exists; that even in untreated adenomas the predominantly adenomatous character is brought about by the preponderance of the male hormone (androgen); and that in the presence of a predominantly fibromyoma-

tous structure of the adenoma the preponderance of estrogen is to be assumed. Thus, the recognition of the predominant histologic structure of the hypertrophic gland may permit a truly adequate hormonal treatment of the early hypertrophic process and of inoperable processes of prostatic adenoma, and preoperative treatment of disturbed renal function. The punch-cannula biopsy method promises to provide decisive indications in the matter of hormonal therapy.

As a matter of fact, in a series of 54 prostatic adenomas, the presence of the glandular, adenomatous form could be determined 33 times (61.1 per cent), an adenomyomatous form was diagnosed biopsically 18 times (33.3 per cent), and a (fibro)-myomatous form was determined in 3 instances (5.6 per cent).

—John W. Brennan, M.D.

MISCELLANEOUS

Enuresis Nocturna Due to Spina Bifida Occulta; Pathogenetic Hypotheses and Attempts at Cure with Heliotherapy and Pharmacotherapy (L'enuresi notturna da spina bifida occulta; ipotesi patogenetiche e tentativi di cura eliofarmacoterapica). Ottavio Ferulano and Eugenio Jannelli. *Gior. ital. chir.*, 1955, 11: 758.

Fifteen cases of bed-wetting, in which the roentgen examination uncovered a spina bifida occulta, comprise the authors' personal experience. Not all of the patients were in perfect psychosomatic condition; 3 presented a delicate, poorly nourished appearance with micropolyemia and 2 presented psychic depression (melancholia). Nevertheless, complete cure was obtained with the authors' treatment in 100 per cent of the cases, and after a year the enuresis had not returned in 86.66 per cent of the cases.

The treatment consisted of heliotherapy and the use of a drug, dintospina, which tends to prevent deep sleep. The two therapeutic moduses were, as a rule, carried on simultaneously, the course of treatment lasting from 35 to 60 days.

The heliotherapeutic treatments were applied daily for the first 20 sessions, then every 48 hours. The total amounts of exposure to the sun ranged from approximately 12 hours to 24 hours. The exposures were made in the interval from 11 to 13 o'clock. The region of the patient's body exposed lay between the twelfth dorsal vertebra and the crena ani.

The drug was given orally in dosages of 0.5 tablet twice daily to 1 tablet three times daily. At times the drug therapy was continued for a few days after the heliotherapeutic exposures had ceased.

The form of treatment described was selected on the basis of the authors' observations and a study of the literature. They concluded that the cause of the bed-wetting was not the result of a paralytic condition, but of an irritation of the nerve roots within the spinal canal; these roots are irritated by pressure conditions resulting from the structural anomalies of the spinal bifida itself and from the lack of protection normally represented by the vertebral arches. Thus, the irritative stimuli represented by the pressure, or traction, on the conus medullaris cause an enuresis by way of a direct action on the medullary center of the automatic micturitional reflex of Budge, the threshold of physiologic excitability of which is lowered to the point where it reacts to stimuli below the limit of vesical repletion. Meanwhile the inhibitor impulses coming down from the cortical centers become depressed during deep sleep to the point where they are overcome by the detrusor impulse. It is this deep sleep that the drug dintospina tends to prevent.

The heliotherapeutic effect is thought to consist simply in a modification of the state of irritability of the nerve roots; however, it is probable that the sun bathing produces a much more complex action than that of a mere tonic effect on the nerve paths. There may also be at play the sedative, antispastic, and hyperemic actions attributed by Sorrentino to his method of Marconi therapy.

—John W. Brennan, M.D.

Humoral Disturbances Arising from the Contact of the Urine with the Intestinal Mucosa (Troubles humoraux par contact de l'urine et d'une muqueuse intestinale). M. Legrain. *J. urol. méd.*, Par., 1955, 61: 360.

Thirteen patients with ureterocolic anastomoses have been studied by the author and a hyperchloremic acidosis demonstrated in 12; this condition was encountered from 4 months to 5 years after the operation. In these patients the condition had not caused any serious symptoms and the author believes that the acidemia will remain largely latent in patients with normally functioning kidneys; nevertheless, he thinks that it demonstrates the need for closely following the acid base equilibrium in these patients. In the one instance of coma in a patient with a uterocolic anastomosis this was easily controlled by treatment.

The pathogenesis of the disturbances experienced in these types (uterocolic, enterocystoplastic, uteroileocystoplastic) of urinary derivation has been discussed extensively by other workers; an excellent article may be found in Surgery, Gynecology & Obstetrics, 1953, 96: 541. All in all, it is considered that the preponderant role in these troubles is the hyperchloremia and that this condition has to do with a process of reabsorption from the bowel. In the author's opinion the role of the intestine is more important than that of the kidney, although there is no doubt that the bouts of pyelonephritis, particularly those following the Coffey technique, tend to aggravate the condition.

Although the ureterocolic derivation is undoubtedly the chief offender in these humoral disturbances following the bringing of the urine in contact with the intestinal mucosa, the other methods here mentioned are not entirely devoid of such biologic disturbances.

Although the presence of these disturbances is generally admitted, nevertheless, the author thinks that their importance may be overestimated. The disturbances are as follows: elevation of the uric acid in the blood, hyperchloremia, lowering of the alkali reserve, thirst, polyuria, physical and psychic asthenia, anorexia, nausea and vomiting, chilly sensations, and diarrhea. Although it is still too early to evaluate the ultimate fate of the patients, the disturbances seem to be transient in character and easily influenced by treatment.

The treatment, at present, is both preventive and curative. The present measures consist, in the main, in

frequent evacuation of urine, a salt-poor diet, and alkalies (2 to 4 gm. daily of sodium citrate). The author has been prescribing courses of sulphaguanidine; however, in one of his patients, this regimen did not prevent the appearance of hyperchloremic acidosis.

Curative therapy consists in the administration of alkalies (4 to 8 gm. of sodium citrate) and the restriction of salt. In 2 of the author's patients this regimen had to be stopped because of attacks of hypertension. In the presence of a diminished alkali reserve the dispensing of 2 to 6 gm. of citrate of potassium seems to relieve the symptoms.

In the matter of treatment, however, the simpler measure must not be forgotten; frequently even the patients in coma can be relieved of their symptoms, particularly those with ureterocolic urinary derivation, merely by the use of a rectal tube for constant drainage of the intestinal urinary reservoir.

—*John W. Brennan, M.D.*

Prostatic Patients and Cardiopathy; Indications for Operation and Incident Risks (Prostatici e cardiopatie; indicazioni operatorie e rischio). SAVINO FANTONI. *Ann. ital. chir.*, 1955, 32: 311.

A HUNDRED AND SEVENTY-FIVE of the 286 patients with prostatic disease received at the general surgical clinic of the University of Pavia in Italy, in the period from January, 1949 to the end of 1953, showed clinical or electrocardiographic signs of cardiac disturbances. Of this number, 19 presented only clinical symptoms and 29 presented only electrocardiographic signs; 127 presented both clinical and electrocardiographic symptoms.

Of the total number of patients, 222 were prostatectomized, 4 were subjected to a definitive suprapubic cystostomy, 33 were pronounced inoperable, and 31 refused the intervention proposed. There were 6 deaths (4 patients died from a complicating heart disease and 2 from other causes). Thus, the mortality for all the prostatectomized patients was 2.7 per cent; the mortality among the patients with sound hearts was 2 per cent; the mortality for the prostatectomized patients with heart disease was 3.3 per cent, and the mortality among those received in a condition of congestive heart failure was 16 per cent.

In the patients with cardiac decompensation no other measure was so efficacious in procuring and maintaining compensation as suprapubic drainage of the bladder. In many instances, in fact, the condition of chronic distention of the urinary bladder may be considered as the sole etiologic factor of the cardiocirculatory disturbance. Thus, even in heart conditions of a certain degree of severity, adequate preparation (bladder drainage; cardiotonics), the careful choice of the method of anesthesia (pentothal and then light ether anesthesia for the prostatectomy; local anesthesia for the suprapubic cystostomy), and careful choice of the method of operation (the simple Freyer prostatectomy is preferred by the author) may render the risk not essentially greater than for that in cases without evidence of cardiopathy.

Of particular significance in these patients, however, are the marked grades of aortic insufficiency, some forms of hypertensive heart disease, and marked damage to the myocardium as the sequel of a myocardial infarct. These conditions, even in the absence of active decompensatory symptoms, represent a grave risk of postoperative cardiovascular insufficiency.

The decompensated heart represents an immediate operative risk; however, it is never in itself a contraindication to prostatectomy. The indications vary with the gravity of the decompensation and the factors causing it. Of the causative factors, the most important are the aortic insufficiencies, the coronary affections, and the auricular fibrillation which is accompanied by organic cardiopathy, that is, not on a uremic or other toxic basis.

—*John W. Brennan, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Considerations with Reference to the Giant Cell Tumor or Osteoclastoma (Ueber Riesenzelltumor oder Osteoklastom). SVEN WERNE. *Chirurg*, 1955, 26: 346.

TWO INSTANCES of giant cell tumor which were originally benign but in which a malignant transformation was later observed are reported. These 2 cases were included in a series of 7 giant cell tumors which recurred after removal. The 7 instances comprised a portion of 13 pathologicoanatomically verified instances of this neoplasm which were treated at the orthopedic clinic of the University of Lund, Sweden, in the period from 1942 to 1952.

The first case was that of a 32 year old woman who, at the time of her first admittance, had been suffering for about a year with pain in the left thigh region. The roentgen examination disclosed, in the proximal end of the left femur, changes which seemed most likely to represent those produced by a giant cell tumor. The lesion was curetted out and the resulting bone defect filled with bone chips and a bone transplant. The tissue specimens procured showed essentially a cell-rich fibrous stroma and numerous rounded or irregularly contoured giant cells with numerous centrally aggregated nuclei. There was no evidence of malignancy.

The roentgen examination a year later uncovered a recurrent condition with cyst formation in the entire mass of the trochanter and evidence of bone resorption in the region of the femoral head and neck. The recurrent focus was again curetted, the curetted tissue resembling in every detail the previous specimen. After another year the roentgen examination exhibited a total resorption of the femoral neck and defects in the region of the previous cystic formations in the region of the trochanter major.

The entire upper portion of the femur was removed and replaced by an acrylic prosthesis. Again the histologic findings on the tissues of the removed specimen were unchanged.

Two years later the patient began to experience weakness, and there were pains and lancinating sensations in the region of the left hip. This region appeared to be swollen. At this time the roentgenogram disclosed an involvement of the bones of the pelvis. An extensive amputation of the left lower extremity and the involved portion of the pelvis (hind quarter amputation) was carried out. The tissues of the removed specimen exhibited evident signs of malignancy. The giant cells were not so large or so numerous as previously. The stroma consisted of a spindle-celled and round-celled fibrous tissue. In some areas there were no giant cells visible, the areas giving the definite impression of a sarcomatous structure. There was present a considerable tendency toward atypia of the cells and in places mitoses were numerous. The histologic diagnosis at this time was giant cell tumor of malignant character. Up to somewhat more than a year after this last operation there was still no evidence of recurrence or metastasis.

The second case was that of a 53 year old woman who had begun to experience weakness in the left knee and moderate pains upon exertion. Six months later, following trauma to this knee, the trouble became intensified; the roentgen examination disclosed a defect in the left femoral condyle which was the size of a hen's egg. The diagnosis was giant cell tumor. The lesion was curetted and filled with an autotransplant from the tibia. The histological diagnosis of the tissues in the removed specimen was giant cell tumor without evidence of malignancy.

Eleven months after this operation (in the meantime 4,000 roentgens of irradiation therapy had been administered) roentgen examination disclosed the fact that the lesion had recurred, had become larger, and extended downward towards the knee joint. The lesion was again curetted and a resection of the knee joint was carried out. Again there was no histologic evidence of malignancy.

Almost 2 years after this last operation the roentgen examination disclosed a recurrence of the lesion. The histologic examination of a biopsy specimen disclosed tumor tissue of marked growth activity, especially expressed in its numerous mitoses. The author considered the type of tumor to correspond to that of a Lichtenstein grade 3. Such a tumor is to be regarded as malignant.

A typical thigh amputation was performed and the histologic study of the removed specimen corresponded entirely with that of the biopsy; that is, there were areas with many giant cells in a stroma of rather normal-appearing connective tissue and a few mitoses, which alternated with other areas in which the giant cells were few and small in size, or were entirely absent, and in which the stroma was polymorphous with many mitoses and was arranged in whorls and bands. Some of the stroma cells contained more than 1 nucleus.

These 2 instances of malignant transformation of a giant cell tumor are to be added to the 20, more or less, which have already been reported.

—*John W. Brennan, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Some Remarks on the Repair of Flexor Tendons in the Hand, with Particular Reference to the Technique of Free Grafting. A. B. WATSON. *Brit. J. Surg.*, 1955, 43: 35.

THE AUTHOR reviews his results of 51 flexor tendon repairs which he feels have reached their final stage. For the purposes of treatment, severed flexor tendons in the hands and digits are divided into four groups:

1. Divisions in the palm. Direct end-to-end suture is employed, if possible primary repair is done at the time of injury. The sublimis is not repaired but the

ends are removed to prevent adhesions. Braided stainless steel is used for suture without pull-out provisions.

2. Divisions of the flexor pollicis longus. The author believes that this is the only tendon which can be sutured within its sheath and then give a good result. Ten cases are reported, 7 of which were repaired by direct end-to-end suture and 3 by a free tendon graft; the results were good in all cases.

3. Division of the profundus only, within 0.5 inch of its attachment to the base of the terminal phalanx. This type of division may be best treated by direct end-to-end suture. If the profundus is divided within its distal 0.5 inch then any roughness caused by the repair will not interfere with the mechanism at the sublimis attachment. A wire suture is again used and brought out on each side of the nail and tied over it. No attempt is made to remove the wire; it is merely cut off at the skin level and allowed to retract. Eleven tendons were treated in this manner and the results have been quite variable.

4. When both tendons are divided at any point within the digital sheath and when the profundus tendon alone is divided at any point proximal to 0.5 inch from its attachment. In this group the only likelihood of good results comes from the insertion of a free tendon graft and it is of utmost importance to pay strict attention to all details.

A free graft of the toe extensor tendon is used in almost every case because it is constantly present; it is a small tendon and is easily threaded through the tunnels; a sufficient length of this tendon can always be obtained.

The whole length of the finger is exposed by a midlateral incision, the flexor sheath is exposed, and as much of it preserved as possible. The distal end of the profundus is removed and a drill hole is prepared in the distal phalanx. If the sublimis is severed its distal end is also removed. An incision is then made in the main palmar crease and the severed tendon is withdrawn into the wound.

The extensor tendon to the fourth toe is then carefully removed through an incision directly over the full length of the tendon.

A V cut is used in the profundus just distal to the lumbrical attachment and the graft is anchored with interrupted braided stainless steel sutures. The free end of the graft is pulled through the previously prepared tunnel (if necessary, new pulleys are formed to prevent bowstringing) and is then attached through the hole in the distal phalanx which was made early in the procedure.

Early in his experiences the author began movements of the finger within 48 hours, but since having several attachments pull out he now immobilizes them all for 3 weeks. He believes that immobilization affords less reaction in the hand and less pain, and the results are as good or better. All the repairs are carried out under tourniquet control in a major operating room and with proper anesthesia.

Tendon suture should be carried out as soon as possible, often during the third week, to prevent fibrosis of the muscle belly. He does not hesitate to do tendon repairs in the very young. Physiotherapy is used if necessary. Any indication of sepsis is a contraindication to repair. Passive flexion should be present before an attempt to repair the tendon is made. Twenty-two free grafts were done with generally good results, in addition to 3 free grafts of the flexor pollicis longus.

Primary tendon suture should not be done except as previously indicated. Primary repair within the sheath is usually doomed to failure and the added fibrosis greatly increases the difficulty in later grafting procedures. —*Bernard C. Gerber, M.D.*

The Treatment of Tuberculosis of the Spine by Evacuation of the Paravertebral Abscess and Curettage of the Vertebral Bodies. M. C. Wilkinson. *J. Bone Surg.*, 1955, 37-B: 382.

In October, 1951, the author reported his early results of curettage in the treatment of 20 patients with tuberculous spinal lesions. He now reports 65 cases with elapse of sufficient time to assess the method. The 65 operations consisted of evacuation of a paravertebral abscess and curettage of the tuberculous disease in the vertebral body, which he calls "central curettage." The patients were divided into a group of 14 children and two groups of adults, one consisting of 34 patients who had the disease in the middle or lower thoracic region and the other consisting of 17 patients who had disease in the lumbar region. Each of these groups was divided into two subgroups, one made up of the patients operated upon in the relatively early stages of the disease during their first admission, and the other consisting of patients operated upon late in the disease on account of re-admission for reactivation or for chronic sluggish disease.

Of the 14 children, 10 had bony ankylosis and 4 had unstable ankylosis. Of the 27 adults with tuberculosis of the middle and lower thoracic vertebrae, operated upon during the relatively early stages of the disease, 18 had bony ankylosis, 2 had reformed vertebral bodies, 4 had formed fibrous ankylosis, and 3 had unstable ankylosis. Of 7 patients with tuberculosis of the middle or lower thoracic vertebrae treated by central curettage and operated upon late in the disease on account of reactivation, 3 had bony ankylosis, 1 patient had firm fibrous ankylosis, and 3 patients had unstable ankylosis. Of 4 patients with tuberculosis of the lumbar spine in the early stages of the disease 2 had reformed vertebrae and 2 had firm fibrous ankylosis. There were none of this group who had bony ankylosis or unstable ankylosis. Of 13 patients subjected to central curettage of the lumbar vertebral bodies after readmittance on account of reactivation of the disease or chronic sluggish disease, 5 had bony ankylosis, 4 had firm fibrous ankylosis, and 4 had unstable ankylosis.

There was no operative mortality and no anxiety on account of possible miliary dissemination. Sinus formation in the line of incision has not occurred infrequently but the sinuses have been of short duration in all but 2 patients. Occasionally a cold abscess has appeared under an operation scar several months after treatment when the spine had been firmly healed. This was caused by residual pus which was not drained at operation on account of the extensive nature of the abscess.

A two-rib costotransversectomy was performed in most of the patients, but a one-rib costotransversec-

tomy was sufficient in young children. The approach was by the technique of Menard. The patients selected for operation were those whose prognosis without operation seemed doubtful or poor.

Sixty of the 65 patients are at home and well, most of them engaged in their normal activities. Thirty-six have bony ankylosis of the affected spinal segments, 4 have reformed vertebrae, and 11 have firm fibrous ankylosis. Fourteen still have an unstable spine although some of these are much improved. Thus, 51 of 65 (78%) have a stable and comfortable spine. The duration of treatment of these patients has been considerably shorter than that formerly necessary. There has been no death among the patients treated by this operation. The average duration of treatment was 6.5 months. Antibiotics supplemented the surgery.

—Daniel H. Levinthal, M.D.

The Results of the Treatment of Congenital Dislocation of the Hip in Children Younger Than 5 Years of Age (Les résultats du traitement de la luxation congénitale de la hanche avant cinq ans). MICHEL SALMON. *Rev. chir. orthop.*, Par., 1955, 41: 191.

THE AUTHOR relates some of his experiences with 400 cases of congenital dislocation of the hip. Open reduction was performed in 80 cases, and conservative treatment was given in the others.

Arthrography of the hip is not a procedure without danger, since the author has observed damage to the articular cartilage of the head. Arthrograms are only of value between 15 months and 4 or 5 years of age. The main information to be obtained is the presence of the isthmus as an obstacle to reduction. When the isthmus is wide the hip is subluxated and conservative treatment should be instituted, but when it is narrow an open reduction is necessary.

In his discussion of some technical points the author stresses the danger of pressure between the head and the acetabulum after reduction and the necessity for a very long follow-up period (to age 18). When open reduction is necessary a shortening of the femur is sometimes carried out. This is done by a subtrochanteric resection, or resection in the upper part of the shaft. The arthroplasties and Colonna type of arthroplasties are followed by a short immobilization and continuous traction. Extracapsular reconstructions of the acetabular roof may be necessary as a primary procedure or later. Joint stiffness may follow open reductions. Stiffness is usually caused by lack of co-operation of the parents in the postoperative care.

—Joseph C. Mulier, M.D.

Hip Arthroplasty; Indications and a New Type of Prosthesis (Ou en est l'arthroplastie de la hanche indications et nouvelle prothèse). J. J. HERBERT. *Sem. hôp. Paris, Ann. chir.*, 1955, 8: 463.

FAILURES of Judet's prosthesis are due to the unequally divided pressure of the prosthesis on the remaining portion of the neck, and the fact that this pressure per square inch is greater than the pressure under normal circumstances.

To improve on these and other factors, the author constructed a new type acrylic prosthesis with an eccentrically placed metal stem. In 26 cases, good results were obtained with this prosthesis. Its advantages may be summarized as follows: (1) the destruction of the weight-bearing trabeculae at the medial part of the femoral neck is avoided; (2) the stem is parallel to the lines of the pressure forces on the femoral neck; (3) the surface of the prosthesis which is in contact with the neck is half spherical, and the pressure is equally divided; (4) the surface of bone subject to pressure from the prosthesis is much greater; and (5) the head is larger than the normal head.

According to the author, a Smith-Peterson cup arthroplasty is indicated in the presence of an ankylosis without architectural changes, i.e., Strümpell-Marie disease with ankylosis, or subluxations in which the head has retained its normal shape, but a new acetabulum must be created.

A head prosthesis is indicated whenever there is destruction of the head, causing a decrease of length of the neck, i.e., degenerative arthritis, posttraumatic aseptic necrosis, and congenital dislocation. In these cases the author uses his own prosthesis.

A head and neck prosthesis is indicated whenever there is considerable destruction, i.e., in instances of nonunion, posttraumatic aseptic necrosis, and other severe conditions. *—Joseph C. Mulier, M.D.*

Results of the Operation of Colonna and Its Modifications (Résultats de l'opération de Colonna and de ses dérivées). PIERRE BERTRAND. *Rev. chir. orthop.*, Par., 1955, 41: 203.

THE AUTHOR performed the operation of Colonna on 132 patients with congenital dislocation of the hip. When continuous traction, in high dislocation, proved to be insufficient to obtain a lowering of the head of the femur, the technique was modified by adding a resection of the diaphysis.

Although in general it can be said that Colonna's arthroplasty is indicated whenever there is a change in the shape of the femoral head, or an alteration of the cartilaginous covering of the head or of the acetabulum, exposing the joint to stiffness after operative reduction, the procedure seems to be especially useful in reluxations and subluxations occurring after open or closed reduction and in untreated luxations (in children older than 4 years of age) which cannot be reduced by the closed method. The following technical points are important:

1. Although carried out routinely, preoperative traction seems unimportant.

2. The capsule of the hip joint should be incised over the isthmus in luxations; in subluxations, as much as possible of the capsule is saved, and the incision is made as close as possible to the rim of the acetabulum.

3. The acetabulum should be deepened at its original location.

4. If reduction is impossible, the author's modification of the operation is carried out. This modification consists in resection of the shaft of the femur 10 centimeters below the trochanteric region, and the incision is made obliquely from proximal to distal and lateral to medial. The anteversion may be corrected, and the fragments fixed by a Kuntscher nail.

5. Immobilization in abduction and neutral rotation in a plaster cast for a period of one month is

necessary, and only after five or six months is weight-bearing allowed.

In fresh cases good results were obtained in 70 per cent; in reluxations in 58 per cent; and in subluxations in 63 per cent.

Good results were obtained in 26 per cent of cases in which the modified technique was employed. The good results were generally obtained in children between 5 and 8 years of age.

—Joseph C. Mulier, M.D.

The Treatment of Congenital Absence of the Peroneus (Il trattamento dell'assenza congenita del perone). S. Branciforti, A. Franz, and I. F. Goidanich. *Chir. org. movim.*, 1955, 41: 347.

Thirty-three instances of congenital absence of the peroneal bone, together with a consideration of the cases reported in the literature, form the basis for this discussion of treatment. The 33 patients were observed at the Rissoli Institute, Bologna, Italy, during the period from 1922 to 1951. These 33 cases raise the number reported in the literature to about 400.

In 4 of the 33 cases, the deformity was bilateral and symmetrical; in 31 cases there was total absence of the peroneus; in 3 cases the lesion was isolated, and in 27 cases the anomaly was associated with malformation of the foot; in 13 instances there was absence of the fourth and fifth metatarsophalangeal radiants; in 7 cases the fifth radiant was missing; in 4 cases the third, fourth, and fifth; in 2, the second, third, fourth, and fifth; and in 1 case the second radiant alone. The tibia was bowed in its medioinferior third in 18 instances; it was atrophic but not deformed in 15 and it was lacking in its lower third in 4 cases. In 2 instances the foot was completely dislocated from the articulation with the tibia, which gave the appearance of a flail-like appendage.

In this material the shortening of the limb (or limbs) varied from a minimum of 1 centimeter to a maximum of 20 centimeters; the average shortening was 3 to 4 centimeters.

With regard to the pathogenesis, the authors do not believe that there is sufficient evidence at present to propose a unitarian theory.

It is considered advantageous to begin as early as possible with corrective maneuvers and immobilization in a cast, in order to forestall the deviation in valgopronation of the foot. This corrective therapy is aimed at facilitating the successful application of orthopedic shoes or prosthetic appliances; or, if necessary, as a preparation for the surgical intervention.

After the first year, the authors prefer to proceed at once with an arthrodesis. For this procedure they prefer to use the technique of Putti. The operation consists essentially in an arthrodesis accomplished by forming the lower end of the tibia into a narrow block which is implanted into a slot in the talus, or, if the talus is absent, into the calcaneus. In the shortened extremity, fixation of the foot in a position of equinism is done.

Since 1922 at the Rissoli Institute, 9 patients have been operated upon by this technique. The ages of these patients have ranged from 2 to 6 years and the shortening of the limb has varied from 5 to 20 centimeters. The results, controlled at a distance, have been good in every instance, with one exception in which there was a partial recurrence of the deformity.

Recently Delitala has successfully operated upon 2 patients by means of a modification of the Putti technique; that is, an arthrodesis of the foot in equinism by means of a cuneiform resection, open medially, of the talocalcaneal joint, associated with a posterolateral capsulotomy and removal of the calcaneal apophysis.

In the presence of a marked curvature of the tibia a cuneiform osteotomy at the level of the summit of the curve is practiced.

On the whole, the authors are of the opinion that a shortening of the extremity up to 12 centimeters may be compensated by an orthopedic shoe provided with an elevated heel. For shortenings of more than 12 centimeters, an orthopedic apparatus enveloping the limb up to the middle third of the thigh and fitted with an articulated artificial foot may be applied. Of course, in these instances there is no particular objection to lengthening the femur by the technique of Putti, or of Delitala.

—John W. Brennan, M.D.

FRACTURES AND DISLOCATIONS

Luxation or Subluxation of the Carpometacarpal Joint of the Thumb. Michael Burman. *J. Internat. Coll. Surgeons*, 1955, 24: 45.

Luxation or subluxation of the carpometacarpal joint of the thumb is rather uncommon; it may be traumatic, occupational, paralytic, or operative. The present article deals with habitual subluxations.

Traumatic subluxation of the carpometacarpal joint of the thumb can occur without a fracture. Dislocation can be either volar or dorsal and after the dislocation, continued pain and weakness of the grip indicate the need for surgical correction. Surgically, the author suggests several types of operation to correct the defect; these are plication of the redundant capsule, reenforcement of the capsule by fascia or free-tendon graft, tenodesis (using the palmaris longus tendon), transplantation of a tendon to pull in a direction opposite the direction of subluxation, fusion of the joint, and excision of the greater multangular bone. Prior use of the last two procedures mentioned has not been recorded.

Postoperative luxation of the carpometacarpal joint can occur and usually follows capsulotomy, which is carried out to increase the range of motion in the thumb. This complication was reported in one case of the author's, and was treated by excision of the greater multangular bone.

Paralytic subluxation occurs after paralysis of the thenar muscles, when the intact three oblique muscles of the thumb pull that structure into dorsiflexion. This is commonly seen among persons with the residual effects of poliomyelitis, and is corrected by the use of a heavy braided silk strand passed through drill holes in the styloid process and the greater multangular bone to correct the "drift" of the thumb.

Occupational subluxation of the carpometacarpal joint occurs. The author cites 2 cases. In the first the condition developed in a right-handed jeweler, 33 years old, who had gripped the handle of a file firmly between the opposed right thumb and the straight index finger 5 hours a day for the previous 6 years. On

extension of the thumb the carpometacarpal joint grated and subluxated volarly, but returned to proper position on opposition. Tenodesis was used to stabilize the thumb, the palmaris tendon being utilized as the stabilizing structure. In the second case the condition afflicted a right-handed man, 70 years old, who used an electric buffer brush constantly for several years, with the result that subluxation of the carpometacarpal joint of the thumb occurred. The condition of this patient was corrected by excision of the greater multangular bone, with a good result.

The author utilizes the rest of the paper to discuss the three classes of force which could be exerted upon the carpometacarpal joint to produce this subluxation. These three forces are the force exerted on the carpometacarpal joint in opposition or abduction, that exerted in volar or dorsal thrust, and, finally, the force occasioned by operative release of the carpometacarpal joint of the thumb by total capsulotomy. The author wrote as a final comment that frictional arthritis is the dominant sequel of occupational subluxation of the carpometacarpal joint of the thumb, and he suggested that in this event, or in the presence of volar fixation of the greater multangular bone, excision of the greater multangular bone be advised, rather than fusion of the joint. —*E. W. Johnson, Jr., M.D.*

Fractures and Dislocations of the Vertebral Spine. VILJO LEHTINEN. *Ann. chir. gyn. fenn.*, 1955, 44: Supp. 1.

THE AUTHOR presents a series of 55 cases of fractures involving the vertebral bodies and neural arches, but excluding injuries to the muscular processes, collected from 1941 to 1953. There were 19 injuries involving the cervical spine, 20 of the dorsal spine, and 16 of the lumbar spine.

The usual site of injury to the cervical spine was at C 5–7; this was the site in 14 cases (24%). Fractures of the upper dorsal spine were rare. There was a high frequency of lower dorsal spine fractures; D 11, D 12, or L 1 were involved in 25 cases (43%). Most of the fractures occurred in the age group from 31 to 40 years; 54 per cent occurred in the age group from 31 to 50 years. This distribution is explained by the fact that persons in the most productive phase of their lives are frequently exposed to physical injuries in their work. The female cases (13) were evenly distributed between the different age groups. Fifty-three per cent (29 cases) of the injuries were incurred in falls and stumbles. Traffic accidents accounted for 16 of the cases. The most serious injuries occurred in traffic accidents and falls.

Thirty-six dorsolumbar cases were reported; of these, 32 were wedge-type vertebral body compressions and 4 were comminuted fractures (3 of which were fracture-dislocations with cord lesions). Fifteen of the patients were treated by postural reduction and 21 received "functional" treatment. The average incapacity for work was 7.1 months for those subjected to reduction and 4.3 months for those patients treated functionally (paraplegic patients and those with other severe injuries were not included). The writer emphasizes the advisability of operative disengagement of locked articular processes in cases of dislocation and fracture-dislocation before reduction of the spine is attempted.

Forty-seven per cent of the cervical cases showed very severe injuries. Those patients with vertebral body compression (6), sprains (2), and subluxation of lesser degree with cord symptoms (2) recovered. Two patients with unilateral locking of the interarticular joints and cord symptoms recovered with slightly impaired motility and possess a partial ability to work. The mortality among the cervical cases was 38 per cent (7).

The author doubts whether strong skeletal traction is a safe method of correction in view of the possible aggravation of the cord lesions, and he considers the advisability of performing operative disengagement of locked articular processes on a series of patients and subjecting them to moderate traction to maintain the position until the condition improves to such an extent that the vertebrae can be stabilized with a plaster jacket. —*Bernard C. Gerber, M.D.*

Retarded Consolidation in Fractures Between the Middle and Lower Thirds of the Tibia; Anatomoroentgenologic Studies and Pathogenetic and Clinical Considerations (Il ritardo di consolidazione nelle fratture fra terzo medio and terzo inferiore della tibia; ricerche anatomo-radiologiche e considerazioni patogenetiche e cliniche). FAUSTO LIPPO. *Gior. ital. chir.*, 1955, 11: 739.

THE LEGS of cadavers were injected intra-arterially with minium suspended in linseed oil, and roentgenographic photographs were taken in laterolateral, anteroposterior, and oblique projections. The tibias were then removed from the specimen and pictures were taken to show the arterial supply to the periosteum. Finally, the periosteum was removed and the roentgenographic exposures were repeated for the purpose of demonstrating the blood supply in the haversian canals. In other specimens the ramifications of the nutrient artery were traced.

From these studies the author finds that the rete periostea is of rather meager character in the region between the middle and lower thirds of the tibia—the region where pseudarthrosis evidences a particular tendency to develop. Even the main collaterals from the two large branches going to the leg (the anterior and posterior tibial arteries) appear to be more profuse about the upper regions of the tibia and down near the ankle.

The contribution to this particularly sensitive region by the nutrient arteries is particularly inconspicuous. This would, of course, be anticipated as the bulky Kuentscher nail, which must certainly destroy the ramifications of this vessel, does not appear to interfere in any degree with the process of healing.

Thus, the author believes that the poor blood supply to the lower middle portion of the tibia is a factor in the production of the pseudarthroses which in this region of the bone are a constant tribulation for the surgeon; however, he does not think that the poverty of blood supply is the only factor, since many of the procedures successfully used for this condition must surely interfere more or less with the vascular supply.

In fact, the author has noted in his experiences with some hundreds of fractures of the tibial bone in the course of years at the Pilgrims Hospital (Ospedale dei Pellegrini) in Naples, Italy that this type of pseud-

arthrosis has become a rarity since certain principles have been adopted as the basis for properly directing treatment of these fractures. These principles enunciate that the cause of the frequent retardation of consolidation of these tibial fractures lies in the faulty anatomical reduction, in the imperfect subsequent retention, and in the meager vascular supply of this region.

Thus, the author, in the presence of any doubt as to the efficacy of conservative measures for procuring reduction and retention of lower middle third tibial fracture, does not hesitate to intervene surgically. The reduction is accomplished at once, unless contraindicated by such condition as shock. For retentive material the author prefers plates and screws of vitallium or rustless steel, the appliance to be of ample length and size for meeting the mechanical demands which are encountered.

The author recommends local and regional anesthesia for the reduction, even when surgical intervention is not indicated. Following the operation, periarterial injections with novocain (0.5 per cent) are made (without adrenalin) in the femoral artery at the triangle of Scarpa in order to cause a greater flow of blood to the region of the middle and lower thirds of the tibia. —*John W. Brennan, M.D.*

ORTHOPEDICS IN GENERAL

The Regeneration of Bone; an Exhaustible Process (La rigenerazione dell'osso processo esauribile). S. Teneff and T. Conti. *Chir. org. movim.*, 1955, 42: 265.

Three adult dogs were used as experimental animals. In each, without destruction of the continuity of the bone, a portion of the middle third of the radius, about 1 cm. in length and 0.5 cm. in breadth, was removed with a scalpel. The defect was permitted to heal (replacement of bone) and then the same area was curetted out at the same place. These successive removals of the process of osseous regeneration were carried out at intervals of from 17 to 25 days. After the sixth removal the process was again allowed to progress toward healing for the same interval of time and then the entire area was removed including the contiguous bone tissues. The specimens thus procured were then decalcified and sectioned. The sections were stained with hematoxylin-eosin.

Microscopic examination of the sections disclosed a normal bone structure in the initial removal of bone. The specimen removed after the first healing disclosed numerous osteoid trabeculae occupying the greater part of the microscopic field, especially in correspondence with the marginal zone. These trabeculae were enclosed in a dense connective tissue of fibroblastic type. The osteoid tissue was rich in osteoblasts and meager in cells of the osteoclastic type.

The second removal (not counting the removal of the normal bone) presented much the same histologic findings as the preceding one.

The third removal evidenced a certain limitation of the zone occupied by the osteoid trabeculae and an increase in the amount and extension of the zone occupied by the fibroblastic connective tissue.

The fourth removal no longer presented the image of trabeculae, the osteoid elements being disposed irregularly in the midst of the fibroblastic tissue to give the impression of young bone tissue with a cartilaginous aspect.

The fifth removal showed a further diminution of the osteoid elements with absolute prevalence of the fibroblastic tissue, which showed an impoverishment of osteoblasts and a prevalence of cartilaginous elements and of osteoclastic cells.

The sixth removal exhibited a further accentuation of the findings evidenced in the previous removal.

The seventh removal, taken together with the surrounding margins of normal bone, showed the zone of regeneration occupied by a dense fibroblastic connective tissue. Near the margins of the area were islets of osseous trabeculae of extremely limited extent which were frequently attached to the trabeculae of normal bone. There were only a few collections of osteoblasts; as a rule they were near the borders of the normal bone. There was a prevalence of osteoclasts.

On the whole, the final picture presented the impression of a fibrous callus.

The authors believe that the process of bone repair here discussed is merely an intensification of the process whereby the normal bone is physiologically subjected to loss and repair. They consider that the process takes place in accordance with the action of various factors (vitamins, hormones). What these factors are and how they function is not the concern of the present report; it merely intends to show that these processes of repair, under the stimulus of whatever factors, tend to become exhausted when the stimulus is overdone. They therefore believe that they have demonstrated one of the factors in the production of clinical instances of pseudarthrosis.

—*John W. Brennan, M.D.*

Vascular Changes Caused by the Küntscher Type of Nailing; an Experimental Study in the Rabbit. J. Trueta and A. X. Cavadias. *J. Bone Surg.*, 1955, 37-B: 492.

The authors note that if the circulation of the bone marrow and that of the periosteum in the experimental animal are interrupted, an increase in blood flow through the metaphysial vessels is observed. On the other hand, if the circulation through the nutrient artery and the metaphysial vessels is interrupted it is the periosteal blood flow which increases. Proliferation of the periosteal vessels was always followed by new bone formation. When the blood flow through the nutrient artery was interrupted, it was noticed that approximately the inner two-thirds of the cortex became ischemic and subsequently necrotic, but that the outer third always remained alive, indicating that the main blood supply of the outer third of the cortex came across the periosteum. On the contrary, when the periosteum was stripped and kept detached from the cortex by the interposition of an isolating polythene membrane (the circulation through the nutrient artery having been preserved), only the outer third of the cortex became the site of irregular ischemia and a large periosteal bone (involucrum) formed around the whole shaft.

The correlation between vascular proliferation of the periosteum and bone formation seems to indicate that the Küntscher method of bone nailing operates through the production of persistent ischemia of the

nutrient artery, in which case vascular proliferation of the periosteum would be responsible for the deposit of new layers of periosteal bone.

This research work was done with rabbits, the bone selected being the radius. No immobilization was necessary after fracture of the bone, the ulna acting as a splint. The bone was divided at the same level in all of the animals, and with approximately the same amount of soft tissue damage. The analysis of the results was checked by roentgenologic study and angiograms. Separate experiments were done with young animals and adult animals.

In their series of experiments, the authors have found that the nutrient artery is responsible for the nutrition of the greater part of the cortex. The changes described are produced when a large foreign body is forcibly introduced with considerable violence along the length of the marrow canal. Even if part of the nutrient artery could escape damage, numerous branches would be destroyed and consequently a great part of the diaphysis would be deprived of its nourishment. It is to be noted that in rabbits in which the progress of bone healing is rapid, large parts of the necrotic cortex persist for approximately 8 months after medullary nailing.

—*Daniel H. Levinthal, M.D.*

Ganglia Associated with Elbow and Knee Joints. I. W. Broomhead. *Lancet*, Lond., 1955, 2: 317.

The author describes 14 cases in which ganglia arising in the region of the elbow and the knee joints were treated at the University College Hospital, in London, between 1931 and 1955. In a brief résumé preceding his reports he sums up the various theories of the cause of ganglia of this type, the most favored of which at present is cystic degeneration of the connective tissue. He also mentions, however, the role of trauma and osteoarthritis of the associated joint as predisposing factors. Trauma to the capsule of any joint also has been suggested as being a possible cause of cystic degeneration or synovial herniation leading to formation of the ganglion.

Among the 14 reported cases of ganglia arising near the elbow and knee joints, pressure was produced on the adjacent nerves in 2 cases. All the lesions gave rise to diagnostic difficulty, since the ganglia are not commonly found in these regions. Three of the ganglia were situated around the elbow joint and the remaining 11 were found to be situated in relationship to the knee joint.

Histologically, all the ganglia examined consisted of a thick wall of fibrous tissue containing numerous clefts of various sizes and lined by a layer of endothelial-like cells. The author concluded that even though there were variations in the sites of origin of the ganglia, the microscopic picture indicated that these lesions seem to develop arise on the basis of a common pathologic process.

All the ganglia were treated by operative excision, but 2 patients had been treated by aspiration prior to operation. This had been unsuccessful, and surgical treatment was resorted to in these two instances. The author stressed careful dissection and complete excision of the lesion, whenever possible.

—*E. W. Johnson, Jr., M.D.*

Congenital Flexion-Adduction Deformity of the Thumb (Congenital "Clasped Thumb"). Elden C. Weckesser. *J. Bone Surg.*, 1955, 37-A: 977.

Five patients with congenital flexion-adduction deformity of the thumb were treated by the author at the Hand Clinic of the University Hospital in Cleveland, during the last 5 years. Three of the patients were observed after birth; in these excellent results were achieved with plaster immobilization. The fourth child was 2 years old when first seen and in addition to the deformity of the thumbs, disclosed: clubfeet, large inguinal herniae, and pyloric stenosis. Cast treatment achieved good restorative reduction on the right side, but not the left.

The fifth patient was 9 years of age with a congenital deformity of both hands, torticollis, and an acquired scoliosis. The left hand had an agenesis of the thumb with flexion contracture of the fingers and elbow. The right upper extremity disclosed flexion contractures of the fingers. The treatment consisted of surgical fusion of the thumb with a full-thickness skin graft on the volar surface of the thumb and fingers to avert soft tissue contractures. The flexion deformity was assessed as improved but not overcome. Under differential diagnosis, the author calls attention to the following confusing lesions:

1. Chronic stenosing tendovaginitis (trigger thumb)
2. The thumb in spastic paralysis
3. The thumb in arthrogryposis.

The article is replete with many illustrations of deformed hands and roentgenograms.

In conclusion, the key note of the therapy is early plaster immobilization. If muscle and tendinous structures are irreparable, tendon transfer is indicated to restore active extension of the thumb.

—*Samuel L. Governale, M.D.*

A Reconstructive Method for Extensive Scars of the Leg (Un metodo di plastica globale della gamba per vaste cicatrici). M. Mauro, Jr. *Chir. org. movim.*, 1955, 41: 237.

Sequestrectomy for chronic osteomyelitis of the tibia usually leaves a most disturbing scar. The atrophic, discolored, and nonelastic scar tissue, mostly adherent to the underlying bone, is oftentimes the site of ulcerations that heal with much difficulty. Furthermore, hypertrophy of the tibia and the deformity associated therewith greatly handicap the esthetic result of the procedure.

Most of the commonly used methods of plastic repair usually fail in such cases because of the extension of the area to be reconstructed and the fact that transplants cannot take on a bone surface.

Good results were obtained in 90 per cent of 27 patients treated at the "Istituto Ortopedico Rizzoli" at Bologna, Italy, according to the technique previously suggested by Delitala. The operation is preceded by an intense course of antibiotic treatment and treatment of the skin for several weeks with salicylated solutions and massages in order to improve its nutritional condition and elasticity. Hemostasis is obtained by a tourniquet applied to the base of the limb. The incision is carried out through normal tissues, in the skin surrounding the scar. The latter is then excised from the periphery to the center, and the anterior

aspect of the tibia is removed at the same time. In a few cases, the medial aspect of the tibia, and even the posterior aspect of this bone, had to be excised in order to allow proper closure. Foci of osteomyelitis, if present, are curetted out at this stage.

In one case wedge resection of the tibia and resection of a few centimeters of the fibula were performed in order to correct a valgus deformity. Osteotomy of both bones was carried out in another case to correct a shortening of 4 cm. Multiple drill holes (Beck) were used in the cases in which much sclerosis was present.

The extent of the resection of bone was determined in each case by the facility with which the skin edges could be approximated following satisfactory resection of the scarred area. At this time, a thorough hemostasis was carried out. Great emphasis was put on this, since the presence of hematomas greatly jeopardizes postoperative healing. The wound was then closed with paraffinized silk; it was important that no tension was exerted on the sutures. Five hundred thousand units of penicillin were injected locally and the wound was dressed. No cast was necessary unless osteotomy had been performed. Antibiotics were given intensively in the postoperative period, and any suture that appeared to be under tension was immediately removed. Hematomas were evacuated at once.

Local necrosis at the edge of the incision due to tension on the suture line was frequently encountered, although it did not significantly affect the late results. In one case, asthma developed postoperatively; this was attributed to the elimination of the focal infection. In 2 cases infection developed, and hematomas were present in 4 cases.

Contraindications to this treatment are the following: acute inflammatory processes, too extensive scars, unsatisfactory conditions of the skin, and too advanced age of the patient.

—*Fernand R. Schmidt, M.D.*

Aneurysm After Foot Stabilization. A. Webb-Jones. *J. Bone Surg.*, 1955, 37-B: 440.

Three cases of traumatic aneurysm complicating surgery of the foot are reported.

1. A 15 year old boy developed a throbbing pain in his right foot 29 days after a Steindler operation. He had a large hematoma which pulsated. There was a murmur on auscultation. When the foot was re-explored, a large false sac covered by fibrofatty tissue was found. The clot was evacuated, a bleeding point in the muscle was ligated, and the vessels were tied at both ends. The defect was a 3 mm. hole in the medial plantar artery. The subsequent convalescence was uneventful.

2. A 15 year old boy developed a pulsating swelling noted 11 weeks after a Lambrinudi arthrodesis. An arteriovenous aneurysm involving the dorsalis pedis vessels was excised and the vessels ligated with uneventful convalescence.

3. An 18 year old boy, after a tarsal arthrodesis, developed a swelling on the medial aspect of the foot, noted 15 weeks after surgery (3 weeks after the removal of the plaster cast. At operation an aneurysm of the posterior tibial artery and vein was excised and the vessels were ligated. The convalescence was uneventful.

Only three references dealing with aneurysms of the foot after operation could be found in the literature. The author concludes that adequate exposure and respect for the blood vessels must be observed in this type of surgery, despite the use of the tourniquet.

—*Daniel H. Levinthal, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

The Role of Erythrodiapedesis or Diapedetic Hemorrhage in Venous and Arterial Pathology (Du role de l'érythrodiapédèse; ou hémorragie diapédétique dans la pathologie veineuse et artérielle). R. LERICHE. *Lyon chir.*, 1955, 50: 513.

THIS STUDY of the significance of erythrodiapedesis in circulatory pathology is based on clinical, not experimental, observation, in the hope of obtaining valuable hints for therapeutic purposes. It is stressed that the mechanical result of congestion plays only a small part in the production of erythrodiapedesis which is nearly always of nervous origin, and occurs chiefly in the presence of excessive vasoconstriction, thus explaining its incidence in both arteritic and phlebitic conditions. Occasionally it may be caused by vasodilatation. Besides its incidence in visceral infarcts, erythrodiapedesis may occur in varices, phlebitis, pseudorupture of the vein, periungual ulcerations, nummular spots on the heel in old arteritic individuals and the mummification in dry gangrene.

In varices, the skin along old varices often presents a slight greenish tinge which is emphasized on pressure of the varices with the finger. In contrast to the surrounding skin this area reveals some red corpuscles in the connective tissue, apparently a simple indication of stasis without clinical significance.

The most common type of erythrodiapedesis is that observed in the pigmentation of phlebitic legs preceding ulcer and has erroneously been attributed to syphilis. In studying its first stages it became evident that it represented an infiltration of the skin by massive erythrodiapedesis extending to the dermis and raising a very fragile epidermis. Very gentle removal of an epidermal flap revealed hematic tissue that left blood elements on the tampon.

With regard to the explanation of the mechanism of diapedetic hemorrhage, the vasoconstrictor reflex has its origin in the thickened but nonthrombosed vein running through the area of infarction. When this was removed as a whole, hemorrhage did not recur and the ulcer healed. After 8 years in one case the pigmentation had faded considerably and the ulcer remained closed in spite of a new pregnancy.

In false venous rupture one has to deal with erythrodiapedesis in apparently normal veins. Following an emotional or physical shock with severe pain in the leg an extensive ecchymosis develops. There is no hematoma, yet the physician frequently speaks of venous fragility and rupture. The ecchymosis gradually disappears and there is never any blood collection. Phlebography and exploration reveal normal veins with no interruption in their course. Spinal infiltration and intrafemoral injection of procaine afford relief. The skin resumes its normal appearance and the venous configuration is intact. In attempting to determine the mechanism and cause of the spasm, it is suggested that they constitute erythrodiapedesis in a vein in spasm.

Diapedetic hemorrhage is found in Volkmann's ischemia and in patients with arteritis. It is the cause of periungual ulcerations. Red corpuscles can be demonstrated in the skin bordering on the ulceration. Excision of nummular spots on the heel in aged arteritics reveals hemorrhagic tissue deep in the fatty tissue, the excision of which relieves the pain. The author believes that diapedetic hemorrhage is also the cause of mummification of the toes and legs in dry gangrene. Apparently some residual circulation exists in the ischemic zone and vasoconstriction forces the red corpuscles to escape from the capillaries which results in a change of color in the ischemic areas so that they finally become black and mummified. This slight residual circulation explains the urgency of vasodilating operations (arteriectomy and ganglionectomy) in acute ischemias. Common ecchymosis will also require study to determine whether it does not correspond histologically to an erythrodiapedesis.

An inverse mechanism of erythropoiesis explains the pigmentation following active vasodilatation in Raynaud's disease. Circulatory life is described as a constant equilibrium between two opposite states. Each pole may cause the same reactions and pains physiologically. —*Edith Schanche Moore.*

Elongated and Enlarged Arteries (A proposito di un caso di dolicomega-arterie). LUIGI TORRACA. *Gior. ital. chir.*, 1955, 11: 717.

THE AUTHOR recalls an article he published in 1921 in which he described abnormally long and large brachial arteries in a 60 year old female. The arteries were large and dilated, ran a serpentine course, and were visible in both arms. They were diagnosed as localized arteriosclerosis of the brachial (humeral) arteries.

In view of the recent article on elongated and enlarged arteries by Parodi and Guffanti (*Rass. ital. chir.*, 1952, 1: 45) the author thinks that his article represents the first reported case of this condition. However, he does not wish to claim priority on the subject but refers to an atlas published by Barkow in 1872. This atlas contains 6 illustrations of numerous anomalous arteries which can be classified as dolichoarteries, which were found in 2 cadavers. An illustration of his own case and four illustrations from Barkow's Atlas are reproduced in the article.

—*Lucian J. Fronduti, M.D.*

Conservative Treatment of Arterial Wounds Caused by Firearms (Traitement conservateur des traumatismes artériels par armes a feu). NOUYEN-HUU and PHAN-HA THANH. *Lyon chir.*, 1955, 50: 517.

THIS WORK is based on the observation of 43 cases of arterial wounds caused by firearms during the Indochinese war between May, 1953 and July, 1954. The use of clamps, nontraumatic needles and eversion sutures, and antibiotics and anticoagulants have extended the limits of conservative treatment. Lateral suture, end-to-end suture, or grafts may be indicated,

and whenever possible should be completed before inflammation has developed. Diagnosis is often difficult and may necessitate exploratory operation. Auscultation of the area may reveal the systolic murmur of early pulsatile hematoma or the continuous murmur of arteriovenous fistula. Arteriography is not indicated in emergency cases. An arterial lesion may be suspected when the path of the missile seems to cross that of the large blood vessels. If the missile just grazes the wall of the artery, with contusion of the wall, sympathetic treatment may suffice, while in endarteritic contusion with rupture of the end artery, gentle palpation may reveal internal thrombosis. When the artery has been definitely wounded, one may have to deal with complete section of the artery or an arterial seton. Of greater interest are wounds involving veins and arteries which may give rise to traumatic arteriovenous fistulas. There may be a simple fistula, or an aneurysmal sac. In 2 cases the rare condition of fistula between the lateral wound of the main arterial axis and the wounded collateral vein was observed. In another case a phleboarteriostomy manifest in the first hour following the accident failed to function 3 hours later because of thrombosis of the satellite vein.

It is important to determine, if possible, the extent of histologic changes in the walls around the site of impact, which may form the starting point for later thrombosis and imposes the need for an adequate excision of the wounded area. Late pulsatile hematomas may develop because of rupture of the scar in arterial contusion.

In the present series the wounds included 5 endarteritic contusions with thromboses, 4 arterial setons, 4 lateral wounds, 3 complete sections, 11 arteriovenous aneurysms, 14 false aneurysms or pulsatile hematomas, and 3 secondary hemorrhages due to rupture of the scar.

Treatment must be prompt and preferably instituted in a properly equipped hospital since early incorrect treatment may prove more disastrous than a little later correct treatment. In general, the rules laid down by Leriche for vascular surgery were followed. Exposure of the artery to normal tissue both above and below the site of injury prolongs the operation but is preferable. Temporary hemostatic measures may be followed by major procedures such as direct compression of the abdominal aorta after suprasubumbilical laparotomy. For control of hemorrhage at the base of the neck the thoracotomy for cardiovascular surgery may be indicated to provide adequate exposure. The authors performed one anterior thoracotomy through the third interspace for exposure of the intrathoracic left subclavian artery and two total median sternotomies for exposure of the arterial brachiocephalic trunk. Suture should be final since clamps and forceps may increase hemorrhage or injure the vessel wall. The wounded area is resected to normal tissue. Of the various conservative operations Blalock's simple mattress suture was preferred to Carrel's suture which was used only for small lateral wounds.

The operation itself varies according to the type of lesion. Excellent results were obtained with lateral suture in partial wounds involving less than one-third of the circumference of the vessel: the suture may also be transverse or longitudinal. End-to-end suture is the operation of choice yielding the safest and best functional results, but is possible only when the arterial wall remains sufficiently normal and the distance between the two stumps following resection does not surpass 3 to 4 cm. If the sutures are too tense they may rupture, and therefore it is best to use grafts when the breach is more extensive. The grafts employed in this series averaged 6 to 8 cm. and did not exceed 12 cm. Venous autografts from the superficial femoral vein were used. Arterial homografts yielded less favorable results in this series and were taken from apparently normal soldiers who died on the operating table. In extemporaneous grafts the significance of vascular retraction following section imposes the need for measuring the segments to prevent unrolling of the graft following removal of the clamps. A preserved homograft (Gross) was used only once, with good results.

Anticoagulants used during the course of operation were not administered by the general route in the postoperative phase since this would be dangerous without strict control of the coagulability of the blood which is impossible (under the conditions of war). Americans offered similar advice during the Korean War.

In 8 of 9 lateral sutures the results were excellent and in 1 case they were good. In 13 of 23 cases the results of end-to-end sutures were excellent, in 6 cases they were good, in 2 cases they were passable, in 1 case there was failure and in 1 case amputation was done. In 6 cases of venous autograft there were 3 excellent results, 2 good results, and 1 fair result. The result in the single case in which Gross's preserved graft was used was good. In 1 case in which the graft had been preserved in serum for 10 hours, amputation was required, and in 3 cases in which fresh grafts were used the results were excellent in 1 case, fair in 1 case, and proved to be a failure in 1 case. Thus, in a total of 43 cases, excellent results were obtained in 25, good results in 10, fair results in 4, failure in 2 cases, and amputation was necessary in 2 cases. Summarizing, there were 35 good results (80%), and 4 failures, 2 of which necessitated amputation. The results of treatment are also tabulated according to the segments involved. Conservative treatment is definitely superior to ligature as demonstrated by statistics from the two World Wars and the Korean War.

The chief aim of surgery is restoration of the continuity of the vessel, and conservative surgery must be applied early before inflammation occurs; exploratory operation should be done for diagnosis if required.

—*Edith Schanche Moore.*

Indications in the Treatment of Embolism of Large Peripheral Arteries (Zur Indikationsstellung bei der Behandlung von Embolien grosser, peripherer Arterienstaemme). E. STRAHBERGER. *Klin. Med.*, Wien., 1955, 10: 360.

THE AUTHOR, of the Second Surgical Hospital of the University of Vienna, Austria, observed a series of 49 cases of embolism of the large peripheral arteries, including the bifurcation of the abdominal aorta, the common iliac, femoral, popliteal, and brachial arteries. He discusses the indications and results of conservative and surgical therapy.

In addition to general supportive treatment of the cardiovascular system, conservative treatment consists in the use of anticoagulant and spasmolytic drugs. Of the spasmolytic substances, papaverin gives the best results; it should also be applied in all cases in which embolectomy is done.

The indication for surgery depends mainly on the time of onset. The writer considers an early embolectomy one done within 8 hours. Only in these cases has the removal of the embolus some chance of success, although 1 case is on record in which embolectomy combined with local sympathectomy was successful 32 hours after the onset of symptoms. In practically all cases, however, secondary thrombosis of the occluded vessel precludes successful surgery after the 8 hour limit.

Among the 49 cases 22 were early ones, in 27 the embolic process was older than 8 hours, up to 14 days. It is noteworthy that in 12 cases the typical acute onset with severe pain was missing. The insidious beginning in these cases gave rise to erroneous diagnoses such as thrombophlebitis and vascular spasm.

The results of embolectomy were not too encouraging. The operation was done in 16 cases, within 8 hours in 13 of them, and from 10 to 14 hours after embolism in 3 cases. Only in 3 of the 16 was the intervention successful (all cases of embolism of the femoral artery); one patient survived after amputation, and 12 patients died postoperatively, 8 of circulatory failure, 2 of cerebral embolism, 1 of pneumonia, and 1 of uremia.

The 33 patients who were not operated on were treated with spasmolytic drugs, and 7 of these received dicumarol or heparin in addition. Nine of these patients were well at the time of the follow-up, 8 survived after amputation, and 16 had died.

Summarizing, the author states that embolectomy is indicated within 8 hours after the onset in embolism proximal to the popliteal artery, whereas embolism of the popliteal, axillary, brachial, or more peripheral arteries should be treated conservatively, preferably with spasmolytics as the success of anticoagulant drugs seems questionable. —*Werner M. Solmitz, M.D.*

The Fate of Splinted Venous Homografts and Autografts in the Thoracic Aorta of Dogs. WHEELOCK A. SOUTHGATE, JOHN J. FOMON, and EARLE B. MAHONEY. *Angiology*, 1955, 6: 427.

THE AUTHORS report on the fate of splinted venous homografts and autografts in the thoracic aorta of dogs. The grafts were obtained from the inferior vena cava under sterile conditions. They were stored in Tyrode's or Ringer's solution to which had been added 10 ml. of homogolous serum, streptomycin, and aqueous penicillin. They were refrigerated at a temperature that ranged from 0 to 4 degrees C. The duration of storage varied from 1 to 56 days. The graft lengths, measured after insertion, ranged from 1.5 to 5.3 cm.

The technique of graft insertion with an intraluminal shunt, and the materials and methods are described, including photographs. Attempts were made to prevent dilatation and degenerative changes in preserved venous autografts and homografts in the thoracic aorta of dogs. Three control groups consisted of unsupported homogenous venous grafts, normal aortas splinted with tantalum gauze, and normal aortas splinted with a plastic sponge.

In the other groups venous autografts and/or homografts were splinted with tantalum gauze or with plastic sponge. One or more aortograms were done on all of the dogs. At the time of death the grafts was studied grossly and microscopically.

The tantalum gauze was found to be unsatisfactory for venous homograft and autograft support. In the plastic sponge-wrapped grafts, dilatation occurred but was not progressive. The degree of dilatation bore no relationship to the degenerative changes that occurred in the grafts. It was impossible to determine whether the focal thrombi that formed on the grafts were the cause or the result of the degenerative changes. —*John H. Mohardt, M.D.*

SURGICAL TECHNIQUE

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

The Treatment of Lacerated Wounds. SUMNER L. KOCH. *Surgery*, 1955, 38: 447.

TREATMENT begins with first aid, which consists of immediate covering of the open wound with a sterile dressing or some clean linen (but not a pocket handkerchief), a compression bandage to control bleeding, and an immobilizing splint. Persistent oozing can be arrested by elevation of an affected limb. A tourniquet should be applied only if it is obvious that a badly mangled limb will have to be amputated.

After the wound and the patient are assessed from the point of view of the time factor, extent and character of the injury, general condition, and ability to undergo what may be a prolonged surgical procedure, more definitive care is undertaken. The open wound should be converted into a clean surgical wound by cleansing with plain white soap and sterile warm water, using gloved hands and large cotton sponges. No other method is quite so effective or causes so little trauma to the vulnerable tissues exposed in an open wound. Associated fractures and divided nerves and tendons should be treated in accordance with good surgical technique, and the wound closed without tension, skin grafts or flaps being used whenever necessary.

Remembering that serious allergic reactions may occur following the use of penicillin, as well as so-called superinfection due to pathogenic organisms that play a minor role until the inhibitory effect of penicillin-sensitive organisms is removed, it would seem logical and sensible to restrict the use of antibiotics to cases with definite indications.

The basic fact that the healing of wounds is a function of living tissues, which is not hastened or stimulated, but often retarded, by any chemical agent applied to their surface, is still too often forgotten.

—David T. Petty, M.D.

Hand Injuries (Traumatismos de Mão). BORGES D' ALMEIDA. *Bol. clin. hosp. civ. Lisboa.*, 1954, 18: 379.

IN VIEW of the frequent occurrence of hand injuries, the author reviews the problems presented by these lesions and analyzes the methods of management available for use in the different situations encountered.

The importance of the anatomy and physiology of the organ is stressed and facts referable to muscles, tendons, fibrous and synovial sheaths, and the vascular and nerve supply are presented, the importance of these data being kept in mind in the integral and accurate evaluation of the traumatized hand.

Two fundamental categories of injuries are recognized: (1) stab and sharp edge wounds with severance of the nerves, tendons, or blood vessels in the presence of minimal loss of substance, and (2) lacerations and avulsions associated with extensive losses of substance. It is considered of diagnostic importance to categorize the wounds, and 2 examples of ulnar nerve injury (one produced by a crochet needle, the other by a glass fragment) are mentioned in which the absence of loss of substance suggested minimum injuries.

The etiologic agent involved, the time elapsed since injury, and the functional impairment produced should be determined early. In nerve lesions, areas of anesthesia corresponding to the sensory distribution of the median, radial, and ulnar nerves can be recognized.

If ideal conditions for immediate treatment are not available, definitive therapy should be delayed for 12 or 18 hours later, and early care should be limited to the application of aseptic and hemostatic measures supplemented by the use of antibiotics. When the condition becomes suitable, general anesthesia and a bloodless field are secured. The hand is elevated and a pneumatic cuff is applied intermittently for periods of 45 minutes. Incisions are planned to prevent the formation of scar contractures which can limit the normal range of motion. The standard bayonet palmar incision and the Rank Wakefield finger incisions are illustrated in the original article.

In severe injuries, devitalized tissues, foreign bodies, and loose bone fragments are removed. Conservative amputations of the fingers with an inadequate blood supply is indicated. If doubt exists regarding the true status of the blood supply, a 48 hours' delay of amputation is justified.

Skin repair can be carried out immediately, delayed a few days, or postponed until all inflammatory processes have subsided. Skin obtained from neighboring areas, Thiersh or tubular grafts, and flaps are used according to the requirements of a given case.

If tenorrhaphy is indicated, multiple techniques are available, but some principles should be observed. Midline incisions are avoided and further trauma of the synovial sheaths is prevented. The normal tendon pulleys are respected and suture materials such as silk and pull-out wires which produce minimal foreign body reactions are advantageous. If grafts are necessary the smaller and narrow ones are preferable.

The circumstances created by injuries of the flexor tendons are different from the circumstances surrounding injury of the extensor tendons and they are considered separately. Some of the techniques available for flexor tendon repairs are illustrated in the original article. An end-to-end, end-to-side, or side-to-side anastomosis can be performed with interrupted nonremovable silk sutures or with pull-out steel wires. If the tissues surrounding the anastomosis are taken into consideration, three types of sutures are recognized: (1) free, (2) anchored, and (3) en bloc. A free suture opposes firmly the cut surfaces without anchoring the tendons to the surrounding structures. In anchoring sutures, minimal stitching of the cut tendons is used at the line of section, and anchoring pull-out wires are used to prevent retraction of the proximal segment. If "en bloc" sutures are used, either needles or pull-out wires fix together the tendons and the surrounding structures. En bloc sutures, admittedly, do not prevent the formation of adhesions which are considered an

inevitable result of a normal healing process, but they are advantageous for they require less dissection and exposure of the injured tendons.

If loss of tendon substance is present, small segments of tendon from the palmaris longus may be required. At the proximal end the graft is either sutured by transfixion or is suture in "sandwich," after the proximal end of the tendon is split in a longitudinal direction. The distal end is anastomosed by transosteal fixation (Pulvertaft) or by transosteal transungual fixation (Bunnel).

There is no universal agreement regarding the use or the length of the duration of immobilization of the hand in physiologic position. Mason advocates a 3 weeks' period and Pulvertaft prefers early mobilization on the fourth postoperative day in order to prevent adhesions. It seems more logical to allow ample time (12 to 15 days) for biological reparative processes to take place.

The results of flexor tendon repairs are variable and unpredictable. The age of the patient, the individual tendency toward scar contracture formation, the cooperation displayed in the period of re-education, and the characteristics of the lesion are only a few of the factors that will influence the result obtained.

In the case of extensor tendon injuries the problems presented are simpler. The ends are usually approximated by direct suture, and grafts are used to bridge defects created by loss of substance.

The exposure is obtained by means of transverse incisions. In the fingers these are made over the joints at the level of the skin creases.

Old extensor tendon lesions at the level of the proximal phalanx are repaired by the Clarck method, with a graft and suture of the ends to the interosseous muscles. If the level of the old lesion is the third phalangeal joint, the Marc Iselin method of lateral fixation of the graft with pull-out wires is preferred.

—Néstor S. Martínez M.D.

A Survey of Plasma Electrolyte Changes in a Seriously Injured Battle Casualty; a Study in Korea. JOHN M. HOWARD, JOHN P. FRAWLEY, and CURTIS P. ARTZ. *Arch. Surg.*, 1955, 71: 205.

THE CHANGES in plasma electrolyte concentrations after injury are reflections of dynamic changes within the myriad of cells of the many organs, chief of which is the wound. These changes are believed to represent, in part, the injury and resultant cell degeneration and, in part, the response to the injury and the changes in electrolyte concentrations by living cells.

A soldier with a gangrenous limb may have a net cumulative loss of 480 mEq. of potassium within the first few days after injury. Since the total plasma potassium constitutes only 12 to 14 mEq., and the total extracellular potassium only 60 to 70 mEq., a net loss of 480 mEq. represents a shift of intracellular potassium of considerable magnitude. Similarly, casualties conserved as much as 970 mEq. of sodium, the equivalent of over 6 liters of normal saline.

Extensive studies of plasma sodium and potassium concentrations of 25 severely injured soldiers were carried out, including intervals from admission to 10 days after operation. The potassium concentration of the oliguric patient rises quite rapidly; the nonoliguric patient often demonstrates a transient and less marked elevation. The plasma sodium concentration falls after operation, reaching its lowest level about the third day. Plasma magnesium levels, studied in 8 patients, revealed no definite pattern.

The falling sodium concentration coincided with a period of sodium retention by the kidneys and often coincided with a period in which the fluid infusion consisted of normal saline solution, blood, or dextran, each of which had a sodium concentration approximating that normally found in the plasma. Dilution by infusion was, therefore, not the explanation.

The rising potassium concentration often found during the first 24 hours after injury and operation coincided with a period of potassium diuresis. Probably the increment represents the release of intracellular potassium from the wounded tissue or from cells with altered permeability throughout the body.

—Robert Paradny, M.D.

The Treatment of Mass Civilian Burn Casualties; Care of the Cleveland Hill School Fire Victims. WORTHINGTON G. SCHENK, JR., JAMES G. STEPHENS, JOHN BURKE, HARRY W. HALE, JR., and Others. *Arch. Surg.*, 1955, 71: 196.

THE AUTHORS report their experience with 20 burn casualties admitted to the hospital during a 30-minute period, and state their principles for the care of mass civilian burn casualties.

Eleven of the 20 patients were estimated to have in excess of 20 per cent of body surface burns. With the use of aseptic technique, these patients were placed on sterile sheets, all clothing removed, and covered with sterile drapes, except for the head and extremities which were left exposed for infusions.

Hematocrits were performed hourly, urine volume and specific gravity were measured frequently, and whole blood, serum albumin, and saline were given.

When the blood pressure was maintained and the hematocrit began to fall, definitive care of the wounds was undertaken. In the operating room, occlusive petrolatum gauze pressure dressings were applied. Antibiotics were given as well as tetanus toxoid to those who had been immunized previously.

Tracheostomies were performed on 4 patients with respiratory tract burns, as evidenced by dyspnea and crowing.

After 48 hours, oral fluids only were necessary except for whole blood which was given as the need arose.

Five patients died in from 26 hours to 8.5 days, all with over 60 per cent of body surface burns.

All dressings were removed from the survivors on the seventh or eighth postburn days. The patients were then placed on sterile sheets, without clothes or dressings and with a canopy supporting a sterile sheet above them. No subsequent dressings were used, with the exception of pressure dressings for 8 days after each grafting procedure. Daily tub soaks were given except for 8 days after grafting.

After all tissue had "declared itself" (in 3 weeks), grafting was carried out in stages over a 10 to 16 week period.

In the care of mass civilian burn casualties, administrative planning is essential and rapid screening

is the first prerequisite for effective handling of these cases. The authors believe that whole blood is inadvisable in the early postburn period. Instead, plasma or a plasma expander should be the predominant intravenous fluid in the early period.

Tracheostomy should be performed immediately in patients with severe burns of the face and neck, without waiting for signs of respiratory difficulty.

The authors found that none of the antibiotics is capable of preventing or effectively treating postburn infection. —*Robert Paradny, M.D.*

Serum Sickness and Local Reactions in Tetanus Prophylaxis; a Study of 400 Cases. N. H. MOYNIHAN. *Lancet*, Lond., 1955, 2: 264.

AN ANALYSIS of 7,580 cases in which tetanus antitoxin was given for prophylaxis showed that in 5.3 per cent the injection was followed by some form of reaction. The commonest form (in 2.7 per cent of the cases) was a local reaction. This reaction occurred most frequently on the sixth to the seventh day after injection and consisted of local edema, erythema, and urticaria with burning and itching of the skin about the site of the puncture and even involving the sensitivity test site also. In some cases the rash tended to come and go, but mostly resolved with 3 to 4 days of antihistamine therapy. Serum sickness was seen almost equally as often, i.e., in 2.5 per cent. The incidence of reaction was highest in children and diminished with age. It was higher in the second half of the year than in the first half. Some of the 401 reactions were severe enough to require the patient's admission to the hospital. The erythema, itching at the injection sites, and the irritation and annoyance caused was usually out of proportion to the extent of the original wound.

In spite of improvement in the methods of purifying and refining the serum, the problem of serum reactions is still an important one for the doctor and the patient. It is suggested that in all casualty departments there should be written rules laid down for casualty officers, nurses, and dressers, and that the procedure to be adopted before administration of tetanus antitoxin should be followed. All patients should be asked whether they have had previous injection of serum and, if so, whether they had any kind of reaction. Inquiry should also be made about asthma, hay fever, or other allergic disorders in the patient or in his family. The patient must also be warned about the reactions which may occur and told that if any of these should occur they should be reported.

In the author's series the reactions were treated with antihistaminics and usually the symptoms disappeared in 4 days. None of the symptoms lasted more than 12 days. —*John E. Karabin, M.D.*

Comparative Sensitivity to Penicillin and Erythromycin of 505 Strains of Micrococcus Pyogenes var. Aureus Isolated During 1953 and 1954. S. STANLEY SCHNEIERSON. *Antibiot. M.*, 1955, 1: 442.

PENICILLIN and erythromycin are the two antibiotics most widely used for the treatment of infections caused by Micrococcus pyogenes (Staphylococcus aureus).

The author determined and compared the sensitivity to both penicillin and erythromycin of all pathogenic staphylococci isolated since the introduction of erythromycin at the Mount Sinai Hospital, in New York, approximately 2 years ago. The strains were isolated from the blood, urine, spinal fluid, abscesses, and purulent exudates. Only those organisms obtained on primary culture before treatment were included.

The author describes the procedure employed in his laboratory (tube-dilution) to test bacterial sensitivity to antibiotics.

A total of 175 strains in 1953, and 330 strains in 1954 were tested against both penicillin and erythromycin. All strains inhibited by 0.5 unit/ml. or less of penicillin or by 1.0 unit/ml. or less of erythromycin were classified as "sensitive." Those requiring larger amounts were considered as "resistant."

The percentage of strains of staphylococci sensitive to the action of each antibiotic has remained fairly constant over the 2 year period; thus 64.6 per cent of the total were found to be sensitive to penicillin and 93.6 per cent to erythromycin in 1953, whereas in 1954, 65.1 per cent and 90.1 per cent were sensitive to each, respectively. Thus for penicillin the percentage of penicillin-resistant strains appears to have become stabilized. This coincides with the experience of Needham who noted that after the initial period of increasing resistance to penicillin, the ratio of penicillin-resistant to penicillin-sensitive strains for a given institution finally appears to stabilize and remains relatively constant.

The vast majority of strains of Staphylococcus aureus isolated during the 2-year period were susceptible to erythromycin and have remained so to date.

Of the 505 strains, 473 (93.7%) were sensitive to either erythromycin or penicillin and only 32 (6.3%) were resistant to both. There were 177 strains found to be resistant to penicillin and of these, 145 were sensitive to erythromycin. Only 42 strains were resistant to erythromycin but, of these, 10 were sensitive to penicillin, leaving only 32 resistant to the action of both drugs.

In conclusion the author states it may well be that some of the strains found to be resistant to both antibiotics might still have responded to some other antimicrobial agent such as bacitracin, tetracycline, one of the sulfonamides, streptomycin, chloramphenicol, or neomycin, singly or in combination, including penicillin and erythromycin. If such were the case, few, if any, staphylococci would be completely refractory to chemotherapy. —*Robert Paradny, M.D.*

The Effect of Severe Battle Injury and of Posttraumatic Renal Failure on Resistance to Infection. HENRY H. BALCH. *Ann. Surg.*, 1955, 142: 145.

THE AUTHOR investigated antibacterial defense systems in a group of severely wounded casualties with or without posttraumatic renal insufficiency. Measurements were made of (a) the phagocytic activity of circulating leucocytes, (b) the body's capacity to synthesize specific antibody, and (c) the plasma complement level in patients. These findings were correlated with other clinical data, with particular emphasis on development of infection. Methods are described and a number of clinical examples detailed.

The only abnormality noted in the mechanisms studied was a significant depression in neutrophil polymorphonuclear leucocyte activity within the first 24 hours of wounding, which returned towards normal within 48 hours.

Normal complement activity and normal antibody synthesis were found in most patients. There was no evidence that battle casualties with or without complicating acute renal failure are more prone to develop infection because of a possible deficiency in antibacterial defense mechanisms studied.

Of more importance in the initiation and development of infection after injury are such factors as degree of tissue damage, amount and nature of bacterial contamination, length of time between injury and operation, and adequacy of wound débridement and postoperative care. —*S. Lloyd Teitelman, M.D.*

ANESTHESIA

Experiences with the Method of Neurovegetative Blockade on the Basis of 176 Strumectomies (Erfahrungen ueber die neurovegetative Blockade bei 176 Strumektomien). W. HAUMANN and R. VOSS. *Chirurg*, 1955, 26: 342.

SEVENTY-ONE STRUMECTOMIES were done under the usual evipan-ether narcosis and premedication with megaphen (thorazine), and better results were obtained than had been procured previously. Since then 101 thyroidectomies have been carried out under the full potentiation narcosis.

For this last series of operations the patients were given premedication with phenothiazine (phenargan) and the narcosis consisted exclusively of evipan-sodium solution (1%) in continuous drip with the addition of a muscle relaxant (My 301). The evipan was instilled intravenously in starts and stops (discontinuously), being started when symptoms of restlessness appeared. This was required predominantly during the incision of the skin, and again during its closure. A total of 0.35 gm. was the usual dosage, the rest of the operation being feasible, as a rule, solely with the administration of the muscle relaxant. In the authors' opinion the evipan narcosis is not sufficient without the potentiation.

With the described method of narcosis in the last 105 strumectomies no incidents have been experienced, not even in the patients whom the internists, in consideration of their circulatory condition, had pronounced as being no longer operable.

Additional value of the phenothiazine is seen in the fact that it may be used not alone as a form of premedication, but it may be administered also during the convalescence. This means that during convalescence any renewed irritative manifestations are blocked or at least markedly hindered in their effects (alarm reaction).

The 176 cases operated upon on the authors' service from April to the middle of August of the year 1955 included 30 instances of full Basedow strumas, 27 of thyreotoxicosis with toxic cardiac muscle damage (demonstrated electrocardiographically), 26 of retrosternal or intrathoracically placed goiter, 31 with degenerative thyroid adenomas, 40 of colloid goiter (in part with symptoms of tracheal compression and in part with cosmetic deformities, the latter indication for operation occurring, of course, exclusively in women), 15 of struma with evident displacement and deformity of the trachea, 1 of Riedel struma, 1 with exuberating Langhans goiter, and 2 of carcinoma of the thyroid.

The authors have had marked success with their method of reducing the body temperature; an attempt is made to maintain the temperature at 36 degrees C before the operation. This is accomplished in part by the infusion of fluids at low temperature, in part with ice bags; neither the phenothiazine or even the full lytic cocktail is sufficient to maintain this temperature. Under this form of refrigeration in 7 instances the entire operation could be done with the addition of the muscle relaxant preparation, My 301 alone.

Of course, phenothiazine alone is not depended upon during the postoperative period. The authors recognized the findings of Bier with reference to the results of hypothyroxemia in the production of the postoperative crises in thyroidectomized patients. For this reason the hypothyroxemia was at first combated by intravenous injections of inorganic iodine (endoiodine); however, it was found that following the introduction of the method of pharmacologic blockade the conditions in this respect were entirely different. Here the transformation of the inorganic iodine into thyroxin is decisively interfered with. Thus, there is indicated following the operation the prophylactic administration of thyroxin, in fact, in the presence of full Basedow strumas, thryoxin is administered during the operation itself.

The carrying out of the neurovegetative blockade in instances of thyreotoxicosis and of Basedow disease as a preparatory medication before the operation, and the manipulation of the anesthesia during the operation demands great care, because of the presence, as a rule, of cardiac and circulatory disturbances. It is therefore absolutely required that the potentiated narcosis, in general, and that in instances of thyreotoxicosis and of Basedow disease, in particular, should be conducted by a skilled personnel; however, when such prerequisites are recognized and when the postoperative treatment is conducted properly, it appears to the authors that this is the best method for operative therapy of the Basedow struma.

—*John W. Brennan, M.D.*

Adverse Cerebral Effects of Anesthesia in Old People. P. D. BEDFORD. *Lancet*, Lond., 1955, 2: 259.

IT HAS BEEN established that elderly people often develop transitory confusional states following operations under general anesthesia. It is not so widely appreciated that minor dementias and even permanent catastrophic mental impairment may occasionally be the aftermath. The author has scrutinized some 4,250 patients over the age of 65, who were seen in the Oxford Geriatric Unit for a period of 5 years ending June, 1954 with particular attention to their histories. Of these 4,250 patients 1,193 had undergone some operation under general anesthesia within the previous 15 years; in other words, at or over the age of 50. One-third of these cases or approximately 410 had some changes noticeable by their relatives and

friends following their operation. After careful analysis there were 120 cases scrutinized by the author in which 29 illustrated extreme examples of extreme dementia, 18 of which were operated on while under the author's supervision so that he was able to compare their mental state before and after operation. It is on the basis of these 18 extreme cases that the author has presented his material.

The author attempted to follow several methods and criteria of selection of his cases as follows: (1) personal observation of patients before and after their operation or incident, with particular reference to their intellect, memory, and habits, and their ability to fit into their environment; (2) careful questioning of all those caring for the patient before and after the episode—for example, relatives, friends, neighbors, doctors, and nurses; (3) selection only of those patients who were judged to be mentally entirely normal old people before their operation; (4) selection only of those cases in which the deterioration of intellect, personality, and performance after operation amounted to gross dementia; (5) clinical investigation and follow-up of all patients and post-mortem examination of those who died; and (6) rejection of cases shown at post-mortem examination to have suffered macroscopic cerebral infarction, however long ago.

Six cases presented in this review were representative case histories illustrating the severe dementia following surgery under general anesthesia. The various causes of damage to the cerebrum following anesthesia are: (1) cerebral circulatory failure including anopsia, anemia, stagnation (such as accumulation of metabolic waste products), or cerebral, arterial, or venous thrombosis; (2) drugs; (3) cerebral metabolic disturbances including toxemia, pyrexia, vitamin deficiency, dehydration, and mineral depletion. A discussion of these various causes is presented and the author emphasizes that no single factor or combination of factors, nor even all the circumstances inherent in an operation under general anesthesia, can be incriminated as a direct cause of the dementia which followed in the cases described. Although 18 patients in the series studied suffered serious brain damage, many thousands of other patients have undergone surgical operation under general anesthesia without any ill effect whatsoever. The catastrophy does not seem to be a direct function of the anesthetic used, nor of the severity or duration of the hypotensive state, nor of the extent of hemorrhage, nor yet of any single extraneous factor which has so far been adduced. There must be some individual susceptibility or idiosyncrasy to one or more of the factors concerned in operation under general anesthesia which determines the occurrence of the brain damage. This idiosyncrasy is both rare and unpredictable. However, if nothing can yet be done to detect such idiosyncrasy, it is all the more necessary to avoid factors which may "trigger" the damage in the unduly susceptible person.

It is concluded, from the observation of these patients, that (1) operations on elderly people should be confined to unequivocally necessary cases; (2) premedication and postoperative medication should not be a routine matter, but should be administered only when specifically indicated (it is suggested that paraldehyde depresses the vital centers the least); (3) during and after the operation under anesthesia, it is important that the blood pressure, hemoglobin concentration, and oxygenization of the blood be kept at optimum levels; (4) "hypotensive surgery" is absolutely contraindicated in the elderly patient, and the effect of posture on the blood pressure of patients given muscle relaxant drugs must be appreciated and carefully observed; (5) in the elderly the complications of surgery under general anesthesia must be carefully anticipated, guarded against, and treated—especially dehydration and mineral depletion, vitamin B deficiency states, pulmonary complications or unconsciousness, and postoperative toxemia and pyrexia; (6) when postoperative confusion appears in old people much thought must be given as to its cause and the reason for its precipitation. The vicious circle such as hypnotics, confusion, and more hypnotics must never be allowed to develop. —*John E. Karabin, M.D.*

SURGICAL INSTRUMENTS AND APPARATUS

The Treatment of Desmogenous Finger Contractures (Zur Behandlung desmogener Fingerkontrakturen). ELISABETH WINKLER. *Klin. Med.* Wien., 1955, 10: 277.

THE AUTHOR, of the First Surgical Hospital of the University of Vienna, Austria, discusses the surgical treatment of finger contractures. These may be caused either by scars from burns or injuries, by surgery of Dupuytren's contracture, or by operations for the correction of syndactylia or other congenital malformations.

The author emphasizes that longitudinal incisions on the volar aspect of the fingers or the palm may lead to scar contractures, especially when they include the area of one or more joints. This holds true especially for surgery of Dupuytren's contracture. Frequently the thickened palmar fascia continues with cordlike dense fibrous tissue into the area of one or more interphalangeal joints. In such cases a longitudinal incision from the palm to the finger should be avoided to prevent formation of a cicatrical contracture. The author mobilizes the palmar fascia from a transverse incision at the distal aspect of the palm. Then the fibrous adhesions continuing to the fingers are dissected from separate Z-shaped incisions, the skin between the incisions is tunnelled, and the entire aponeurosis with its fibrous continuations is extirpated. By this method all danger of scar contracture is avoided. If at some point the skin is so closely adherent to the fascia that a postoperative skin necrosis may ensue, the dermis is extirpated with the aponeurosis and a skin graft is done. During the operation a hypotonic drug is given to prevent hematomas in the palm and edema of the dorsum of the hand and the fingers.

Surgery of syndactylism should not be done before the age of 6 years, provided the malformations consist only in webbing of the skin. If malformations of the phalanges are combined with syndactylism, plastic surgery should be done at a much earlier age. In repair of the skin web, no linear incision should be made but the fingers should be separated by a zigzag-shaped incision. The interdigital fold should be formed by a volar, a dorsal, or a volar and dorsal flap. However, some skin grafting is always necessary because a triangular open wound always remains at the base of

both fingers. The author shapes the interdigital fold with a dorsal triangular flap, the apex of which is adapted to the corresponding point (A) at the volar aspect. The resulting triangular defects are covered with skin transplants.

Severe and crippling scar contractures after burns and other injuries can be successfully repaired by plastic surgery, even years after the accident.

—*Werner M. Solmitz, M.D.*

"Total" Operative Asepsis (L'asepsie operatoire "totale"). ROGER LETAC, PIERRE BARROUX, and JEAN-MARIE DANEY. *Bull. mem. l'ecole prep. med. pharm. Dakar.*, 1955, 2: 51.

LISTER'S METHOD of antisepsis, in which, among other measures, the use of phenol spray was advocated, has been replaced by asepsis which aims to eliminate all causes of endogenous and exogenous infection. Whereas in most cases it is possible to avoid endogenous infection, it is much more difficult to ensure reliable protection against air-borne micro-organisms.

Numerous attempts have been made to avoid contamination of the air in the operating rooms; oxygenated water spray, isolation of the rooms, obliteration of corners between walls, elimination of visitors, reduction of the number of assistants, strictly enforced silence, all have had their sponsors, but unfortunately could accomplish only a relative asepsis, none being able to completely eliminate air-borne pathogenic micro-organisms. Air conditioning, precipitation of floating solid particles by electrostatic procedures, and the application of ultraviolet rays were not much more effective.

The authors believe that the role of air-borne bacteria is usually underestimated and that this kind of infection is not infrequently responsible for disruption of the wounds, septicemia, or meningitis.

The authors describe a hermetically sealed chamber in which operations are performed. The chamber is thoroughly sterilized in an autoclave before the surgical intervention. Only the surgeon's and his aides' arms are introduced into cuffs attached to this cubicle to prevent contamination by their breathing air. A rectangular opening in the bottom of the chamber, occluded by sterile adhesive tape, is placed over the site of the incision which is carried through the tape. The rest of the patient's body remains outside of the chamber. The source of illumination is placed above the apparatus. Instruments are taken from a sac fitted into one of the walls of the cubicle and are then placed on a tray within the chamber.

The results of sterility tests have demonstrated the efficiency of this method, which has been employed by the authors for 110 interventions, such as herniorrhaphy, gastrectomy, laminectomy, thoracoplasty, and total parotidectomy. —*Joseph K. Narat, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Remarks with Reference to the Esophageal Orifice of the Diaphragm; Roentgenologic Import (Remarques sur l'orifice oesophagien du diaphragm; intérêt radiologique). R. ROY-CAMILLE. *Press méd.*, 1955, 63: 971.

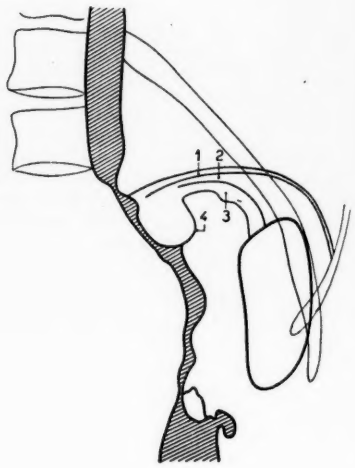
THE ROENTGENOGRAPHIC reproductions in Figs. 1, a and b and 2, a and b present two images of the cardiofundal angle in the region of the esophageal orifice into the stomach. Figure 2, a and b is a reproduction of a case of cancer. In both Figures 1b and 2b "*1*" indicates the diaphragm; in Figure 2b "*2*" indicates the peculiar image which is the object of this report. In Figure 1b "*2*" indicates the shadow transparency representing the air of the pneumoperitoneum. Finally, in Figure 1b "*3*" represents the wall of the stomach and "*4*" represents the image produced by a vegetating juxtacardial cancer without dysphagia. In each of the patients, the one with cancer and the other normal in every respect, the findings could be very easily confused roentgenologically. The problem is typically one for the roentgenologist.

On the basis of the belief that the manifestation rested on an anatomic basis the problem was assigned to the Department of Anatomy of which Cordier is head. The study of thin (1 cm. in thickness) transverse sections taken at the level of the eleventh dorsal vertebra (level of the esophagogastric orifice) from 2 encasted and frozen cadavers (Fig. 3, a and b), with roentgen demonstration and dissections, showed that the image was the result of a protuberance formed by the muscular left border of the esophageal orifice of the diaphragm.

The esophageal orifice is limited by muscular fibers of the diaphragmatic pillars after their mutual intercrossing; however, the right and left borders of the orifice are mutually very different as to topography and as to form. The right border lies anteriorly to the left border; in a thin cross-section (Fig. 3) the right border appears as a thin bladelike structure, that is, it is flattened and comes to a sharp edge toward the orifice. On the other hand, the left border is thickened and swollen-looking, in the form of a crescent. The thickened left border, on dissection, was found to be constantly not less than twice the thickness of the right (4 to 12 mm. on the left).

When the roentgenogram is made with the incident ray passing anteroposteriorly the trajectory strikes the left border of the esophageal orifice of the diaphragm at the point of its greatest thickness, and this is right in the angle between the abdominal portion of the esophagus and the gastric fundus. Thus, in a powerfully developed left pillar of the diaphragm its shadow may represent a large tumorlike structure, seeming,

a



b

FIG. 1 (Camille). Cardiofundal angle in region of esophageal orifice into stomach. a, Roentgenogram; b, drawing.

FIG. 2a

FIG. 2. Another instance of cardiofundal angle in the region of the esophageal orifice into the stomach; cancer was present in this case. a, Drawing; b, roentgenogram.

FIG. 3a and b. Thin transverse sections taken at the level of the eleventh dorsal vertebra (level of the esophagogastric orifice).

indeed, to protrude toward the lumen of the esophagus at this level and to encroach on the border of the fundal contour at its right edge, that is, adjacent to the esophageal orifice. —*John W. Brennan, M.D.*

FIG. 2b

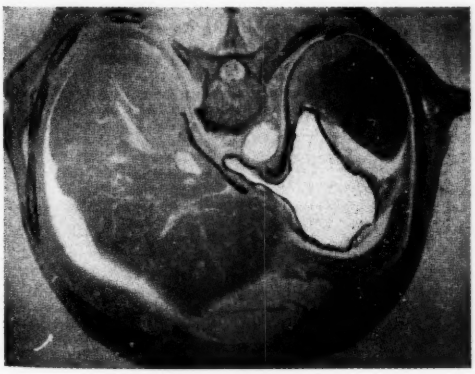


FIG. 3a (Camille).

FIG. 3b (Camille).

Roentgenologic Study of Osseous Changes in Cases of Soft Tissue Hemangiomas of the Extremities (Roentgenologische Studie ossaler Veraenderungen bei Weichteilhaemangiomen der Extremitaeten). A. STECKEN. *Fortsch. Roentgenstrahl.*, 1955, 83: 147.

THE AUTHOR, of the X-ray Institute of the Charité Hospital in Berlin, Germany, examined the bones of the extremities in a number of cases of hemangioma of the soft tissues to study the influence of the tumor on the growth and structure of the bones in the vicinity. The hemangiomas included nevi flammei, cavernous hemangiomas, and phlebarteriectasias. It has been observed by other workers that the long bones as well as the carpal, tarsal, and phalangeal bones near hemangiomas often show various changes including cystic or striate deformation, hyperplasia, or hypoplasia.

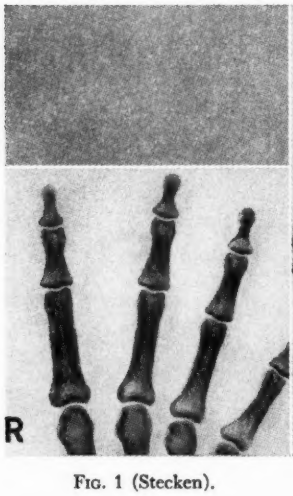


FIG. 1 (Stecken).

FIG. 2.

The author of this article discusses 7 cases of different types of hemangiomas in the soft tissue of the arm and hand. He arrives at the conclusion that the osseous changes are not caused by intraosseous hemangiomas, which are extremely rare, but by intraosseous dilatation of normal blood vessels. There is a close connection between phlebectasias in the soft tissue and the structural changes within the bone. The author assumes that the elevated pressure in the vessels leaving the hemangioma causes marked dilatation and extensive collateral circulation within the bone which, in turn, gives rise to erosion in the surrounding bone and dilatation of the haversian canals. In most cases also a change in the structure of the medullary space will take place under continuous elevated pressure.

These changes could be demonstrated in the roentgenograms which showed markedly dilated vascular canals as well as cystic, granular, and sinuous defects in the "compacta" and in the medullary space.

—Werner M. Solmitz, M.D.

FIG. 3.

FIG. 4.

MISCELLANEOUS

Leukemia in Survivors of Atomic Bombing. WILLIAM C. MOLONEY. *N. England J. M.*, 1955, 253: 88.

NINETY-TWO CASES of leukemia were encountered in the Hiroshima and Nagasaki areas between 1948 and January 1, 1954 among the surviving population. The effect of severe exposure to the atomic bomb radiation is demonstrated by a ratio of leukemia to surviving population of 1 to 172 among severely irradiated survivors compared with a ratio of 1 to 3,323 among lightly or nonirradiated survivors at the same distance from the hypocenter.

The peak year of incidence of leukemia was 1950 with a slight decrease in 1951 and 1952, and a sharp fall in late 1953. Of the 92 cases, 52 were acute or subacute; of 40 chronic cases, 39 were myelogenous.

As previously described, outstanding features before the development of clinical leukemia were leukocytosis, relative lymphopenia, and granulocytosis. Alkaline phosphatase activity of separated leukocytes was extremely low, even in the preclinical phase of the disease. A very significant basophilocytosis was noted.

The author believes that exposure of survivors to irradiation was considerably greater than was calculated by the physicists, and much of the exposure was due to neutron activity. *—Moris Horwitz, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

The Reconstruction and Rehabilitation of Pseudohermaphrodites and True Hermaphrodites, Including a Case of Testicular Feminization. HANS MAY. *Plastic & Reconstr. Surg.*, 1955, 16: 201.

THE AUTHOR PRESENTS cases of pseudohermaphroditism, both male and female, and one case of testicular feminization. An excellent discussion of the anatomical, physiological, and sociological implications of these unusual aberrations for the unfortunate individuals concerned is given, with good descriptions of the operative procedures involved in reconstructing the genitalia of these individuals. It is quite apparent that the patient's sexuality, as determined by gonad biopsy, is not so important a factor as his psychological and psychosexual orientation. These latter factors should dominate the physician's thinking in his efforts to develop normal sexuality for the patient by ablation of one set of organs, not necessarily the less marked of the two sets. The individual's own wishes are important.

Properly performed plastic procedures supported by endocrine therapy and psychotherapy can give the patient a single useful orientation in life, either female or male, but definitely not the orientation of an "it." —*Franklin Lounsbury, M.D.*

A Study of Two Intravenous Fat Emulsions in Human Subjects. HUGO C. MOELLER, MORTON I. GROSSMAN, LUCILLE PALM, ALICE CUSHING, and Others. *J. Laborat. Clin. M.*, 1955, 46: 450.

THE PRINCIPAL side-reaction attending the intravenous infusion of fat emulsions is fever. The mechanism of its production is unknown. Few attempts have been made to correlate biochemical and hematological changes during and after the infusions with the febrile response, and the present study represents such an attempt. It has been suggested that release of endogenous pyrogen from inflammatory cells may be involved in the fever of human disease; and it has been shown that injured or lysed leukocytes release lysozyme into the surrounding medium. White blood cell counts and serum lysozyme determinations were performed in order to examine the possibility that the febrile response to fat emulsions involves this mechanism.

The emulsions studied contained 15 per cent refined cottonseed oil and 15 per cent olive oil as the principal ingredients, respectively. Blood pressure, respiration rate, pulse rate, and rectal temperatures were recorded before, and at intervals during and after the infusions. Clinical observations on nausea, chills, back pain, headache, and other untoward reactions were made at frequent intervals. The mean maximum febrile response with the cottonseed oil product was 1.6 degrees above the control value and occurred within one hour after the end of the infusion. It was 2.3 degrees F. with the olive oil product and occurred in the third postinfusion hour. A well marked leukocytosis occurred with each infusion, with the peak occurring shortly after the end of the infusion, and continued at this level for 4 hours after the end of the infusion.

The one biochemical measurement which showed some tendency to be correlated with fever was the rate of removal of the infused fat from the blood as measured by optical density and total fatty acid concentration. The two emulsions were removed from the blood at different rates. The tendency for a correlation to exist between clearing rate and febrile response suggests that the febrile response is not due to the presence of the unaltered fat particles in the blood but is in some way related to a change in their physicochemical state and/or their removal from the blood. There is no clear indication that free fatty acid levels were correlated with febrile response. There was some tendency for the lysozyme to rise following the olive oil preparation infusions but the correlation with febrile response was poor. These results do not support the hypothesis that leukocyte injury may be involved in the thermogenic response to fat emulsions.

—*James H. Holman, M.D.*

The Diabetic Foot (Il piede diabetico). G. GHERLINZONI. *Chir. org. movim.*, 1955, 41: 488.

THE AUTHOR reviews the literature on the subject of the diabetic foot, and presents a case of recurrent ulceration of the foot which was finally amputated. The specimen was injected and angiograms were taken according to the technique of Bertelli. These proved the clinical impression of absence of vascular disease. The author believes that in the pathogenesis of osteolytic changes in the diabetic foot, there is a positive association of nerve disturbances besides the endocrine and metabolic disturbances.

—*Lucian J. Fronduti, M.D.*

Primary Observations on the Action of Yeasts in the Leukemias (Prime osservazioni sull'azione dei lieviti nelle leucemie). GIOCONDO PROTTI. *Tumori*, Milano, 1955, 41: 273.

IN PREVIOUS REPORTS, the author has demonstrated the lytic action of certain yeasts upon neoplastic cells. He has continued the experiments to include the myelocytes and lymphocytes of patients ill with leukemia. The neoplastic cells were altered while the normal cells showed no obvious changes.

In view of these findings, the author has treated 3 chronic leukemic patients with various yeasts, with good results. These patients had been treated roentgenologically and with radioisotopes, and were considered refractory to further treatment.

Prior to treatment, the author performs tests to determine which of many strains of yeasts has the most destructive action on the neoplastic cells. The yeast strain of Rhodotorula rubra was used in 2 of the patients and Cryptococcus albidus was used in the third patient.

Four patients with acute leukemia and 1 patient with subacute leukemia showed no response to this type of therapy.

The treatment consisted of intravenous injection of the yeasts. In 2 cases doses of 60 gammas were given and were well tolerated. In the third patient the dose was reduced to 2 gamma because of fever reactions produced with higher doses. The treatment was given at various intervals and is being continued. Details as to the preparation and administration of the yeasts have been published in previous articles.

—Lucien J. Fronduti, M.D.

A Study of Pigmented Skin Lesions. J. D. Hicks, B. K. Rank, and A. R. Wakefield. *Austral. N. Zealand J. Surg.*, 1955, 25: 1.

The large groups of innocent melanin-pigmented skin lesions, whether congenital or acquired, are referred to as pigmented nevi by the authors. The word "nevus" has been retained because it is so firmly established and ingrained that it is deemed inadvisable to suggest alterations. The basis of the authors' study concerns the various types of pigmented nevi and the stages of their formation and maturation. The conception of a life history of the pigmented nevus and various aberrations thereof is fundamental.

In most pigmented skin lesions there are collections of small cells with small dark nuclei resembling the basal cells of the epidermis. These nevus cells or melanoblasts frequently occur in clusters and are termed junctional when in contact with the epidermis. Those which are in the dermis and separated by a layer of connective tissue from the epidermis are called intradermal. When only junctional cells are present, the lesion is called a junctional nevus; if only intradermal cells are present it is termed an intradermal nevus. A compound nevus contains both junctional and intradermal cells. The presence of junctional cells bespeaks immaturity, and when they are no longer found the lesion is mature and entirely intradermal. Many junctional nevi never proceed to maturity but remain inert throughout life or undergo an active cellular proliferation which may be the precursor to malignancy; these are termed activated junctional nevi.

Two main features must be present in malignant melanoma: (1) the general cell characteristics of malignancy, and (2) extension of cells beyond normal bounds both upwards, to cause disruption of the epidermis, and downwards, as sheets of cells into the dermis. Juvenile melanoma is characterized by an accumulation of spindle cells or loosely arranged irregular melanoblasts in the epidermis and in the dermal papillae. An uncommon variant of the pigmented nevus is the blue nevus which consists of spindle cells which are spread through the collagen of the dermis and may contain a large amount of melanin pigment which, together with its depth in the dermis, is responsible for the blue-black appearance.

Hairy nevi are generally large and they vary tremendously in the degree or density of both pigment and hair. Histologically all these hairy pigmented lesions show a similar basic pattern in that they conform to the structure of compound nevi. The younger the patients the more junctional proliferation is apparent, and this variation in pattern over the different age groups is significant.

There are a group of lesions occurring on the cheek region of females in the postmenopausal age which show diffuse, irregular, spreading skin pigmentation without raising the skin surface. These areas of "melanosis" or diffuse junctional nevus in elderly people can be described as an extremely premalignant condition. There is an insidious change from junctional activity through borderline and indeterminate states to a clearcut histologic diagnosis of malignancy. Effective removal of these lesions requires radical surface excision on account of their ill-defined and multicentric distribution.

The main clinical groups of lesions are generally seen in the middle decades and consist of the hundreds of small pigmented spots brought to notice for diverse reasons. The mature lesions are raised and generally hairy and correspond with the histologic intradermal nevi. They are of no serious consequence in regard to malignant potentiality. Many small pigmented spots, on the other hand, show the characteristics of immature lesions. They are flat and the pigmentation is superficial. These must be recognized as junctional nevi and it is from these that the great majority of malignant melanomas arise. Puberty, pregnancy, or infection often will produce an increase in size and pigmentation in any existing pigmented lesion.

Probably the only type of pigmented lesion which is potentially malignant is one composed of junctional cells, or junctional groups of cells. Any lesion which appears prior to puberty and runs its full course to maturity—i.e., which loses its junctional component and which becomes entirely intradermal in character—is a safe lesion, and thereafter has no malignant potentiality; whereas, those lesions which are not fully matured by puberty and still retain a junctional component, or which appear after puberty as either junctional or compound nevi may become malignant at any time thereafter. Malignant melanoma only very rarely arises out of a congenital nevus.

The only effective treatment is surgical excision and the reasons for thus treating pigmented lesions are disfigurement, fear of future malignancy, and the fear that the lesion may already be malignant. The first two reasons apply before puberty, and all three apply after puberty. *—James H. Holman, M.D.*

Metastasizing Carcinoma of the Sweat Glands. Carey C. K. Smith. *Brit. J. Surg.*, 1955, 43: 80.

A review of the literature dealing with recurrent adenoma and metastasizing carcinoma of the sweat glands is presented, and the author adds one case of his own. In general, it seems that this type of tumor is very difficult to identify, and again the differentiation between locally recurring sweat gland adenomas and frankly malignant tumor with metastasizing tendencies is difficult from a histologic standpoint. A survey of the world's literature would indicate that the lesion is certainly a rare one.

The reported case is that of an otherwise healthy 40-year-old man who developed a painless small mass on the forehead just under the hairline. Local excision was carried out with an adequate margin of normal tissue on all sides and the histologic diagnosis was that

of an invasive sweat gland adenoma. Fourteen months later he appeared with at least seven small masses, all about the operative area. Three of these lesions were excised and the diagnosis was again sweat gland adenoma. One year later he was examined and found to have five swellings on the forehead which were fixed to the skin but not to the bone. At this time a wide excision and skin graft was carried out, and an enlarged lymph node under the left parotid gland was removed. The pathologic report was sweat gland adenocarcinoma with metastases to the lymph node. Two months later a hard, palpable mass had developed below the ear and a softer mass was present below the angle of the jaw. A radical excision of the parotid gland and radical neck dissection was carried out and examination of the removed nodes showed extensive replacement by sweat gland adenocarcinoma. The parotid gland was not involved. Two months later he was noted to have a couple of small firm swellings below the skin of the supraclavicular region, and further radical surgery was anticipated.

A very extensive account of the histopathologic structure of these sweat gland tumors is given in this article. —*Matthew H. Evoy, M.D.*

The Results of Adrenalectomy for Mammary Cancer with Skeletal Metastases as Demonstrated Roentgenographically. PER ELFVIN. *Acta radiol.*, Stockh., 1955, 44: 25.

THE PURPOSE of this article is to report the roentgenographic changes in the skeletal metastases of 44 patients. All patients had undergone bilateral adrenalectomy and most of the patients had also undergone bilateral oophorectomy because of the skeletal metastases from breast cancer. Roentgen examinations were carried out preoperatively and every other month postoperatively, beginning 2 months after operation.

The metastases were situated in the pelvis in 44 cases, the spine in 42, the thorax in 35, extremities in 29, and the skull in 23 cases.

In 29 patients the metastases were classified before any form of therapy was initiated. Two patients had purely osteosclerotic changes, 4 had mixed osteosclerotic and osteolytic, and 23 had only osteolytic changes.

The results of operation were as follows:

Deaths	9
Survival without postoperative roentgenograms	8
Progress and spread of metastases without sclerosis	8
Sclerosis of the metastases with no sign of spread	19

Of the 9 patients who died, one died immediately after operation and the remaining 8 patients died within 3 months with evidence of rapidly advancing disease. The 8 surviving patients who did not have postoperative roentgenograms have recently undergone roentgenologic examination. Of the 8 patients who died with no evidence of sclerosis, 5 succumbed within 8 months and 3 are still living (within 5 months of operation). The remaining 19 patients showed evidence of sclerosis with arrest of the destructive process. In the majority of cases the sclerosis was in the periphery surrounding the osteolytic area, but in some cases the entire osteolytic area became sclerotic. Normal bone structure occasionally replaced the sclerotic area.

Bone changes began to occur as early as 19 days after operation in one patient; in about 50 per cent of the cases bone changes were evident within 2 months and in the remaining 50 per cent within 4 months. The postoperative appearance of a zone of sclerosis about the metastasis was in every instance accompanied by a halt in the growth and spread of the osteolytic process.

The length of time of remission brought about by the operation is variable. Of the 19 patients in whom the effect of operation was demonstrated by roentgenograms, 3 are dead; regrowth of the metastases occurred within 12 months in 2 of these and the third died at 13 months without adequate roentgenologic follow-up. Sixteen patients are living, 2 of these showing evidence of regrowth of the metastases within 12 months of operation. Fourteen patients show no evidence of spread at the following time interval: less than 6 months in 3 cases; 6 months to 1 year in 9 cases; from 1 to 1.5 years in 1 case; from 1.5 to 2 years in 1 case.

Since the response to androgen therapy and to adrenalectomy are similar roentgenographically, these groups were compared: (a) those who received androgens preoperatively and reacted with sclerosis; (b) those who received preoperative androgen therapy and had not reacted; (c) those given no preoperative therapy. No correlation could be established so that the response to androgen therapy does not indicate the probable response to adrenalectomy.

The clinical course correlated well with the roentgen findings. All 19 patients who showed evidence of sclerosis about the metastases were free of pain, gained weight, showed improvement in their general condition, and were often able to return to their occupation.
—*John H. Davis, M.D.*

EXPERIMENTAL SURGERY

Experimental Studies on the Influence of Osmotherapy on Edema (Experimentelle Untersuchungen zur Frage der osmotherapeutischen Beeinflussbarkeit des Oedems). H. W. SCHEGA. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 479.

THE AUTHOR, of the Surgical Hospital of the University of Mainz, Germany, discusses the physiology of water metabolism and reports on animal experiments for study of the influence of various osmotherapeutic agents on artificially induced edema.

Two different groups of substances are used in osmotherapy: one consists of hypertonic salt or sugar solutions and the other of colloidal solutions such as gelatin, dextran, and similar compounds. Of these, only the hypertonic solutions act by osmosis in the strict sense, whereas the action of the high molecular colloids is water-binding, and their use should more correctly be termed "oncotherapy." There is no agreement in the literature as to whether these substances, especially the hypertonic glucose solutions, are really effective in the treatment of edema, and many authors state that their therapeutic effect is very transitory or absent altogether. Recent investigations by other workers have shown that the capillary wall is not a true semipermeable membrane; and that glucose with its low molecular weight of 180 permeates

it in 0.5 minute or less after an intravenous infusion. Even for crystalloid substances with a molecular weight of from 40,000 to 50,000 the normal capillary wall is more or less permeable. These theoretical considerations make it improbable that these substances can have any influence on the reduction of edema.

To study the influence of these substances on edema, the author used the following technique:

In the anesthetized dog a loop of small intestine was isolated but left in connection with its mesentery so that its blood and nerve supply remained undisturbed. The isolated loop was attached to one arm of the scales while the other arm was connected with a kymograph which registered all weight changes of the intestinal specimen. When 40 per cent of the total blood was withdrawn and replaced by the same volume of saline solution or any other noncolloidal isotonic solution edema developed in the submucosa of the intestinal wall because of the marked drop of oncotic pressure of the blood, and the increased weight of the intestinal loop was registered on the kymograph.

After edema of the intestinal wall had been induced by this method, various substances were infused intravenously to test the influence on the edema. The substances were: hypertonic 10 per cent sodium chloride solution, 40 per cent glucose, 20 per cent gelatin, 10 per cent dextran, 20 per cent human albumin, and periston-N.

The results of these experiments are remarkable. Crystalloid solutions such as hypertonic saline or glucose solutions did not have any influence on reduction of the edema, even when the usual dosage of 1.5 c.c. per kilogram of body weight were exceeded to 5 or 10 c.c. per kilogram. On the contrary, in several experiments the edema increased after infusion of the hypertonic solution, as was shown by the rising weight of the specimen.

In contrast to these negative results, intravenous infusion of high molecular colloidal solutions showed definite influence on the reduction of edema. This applied to all the afore-mentioned substances except for the periston-N which has a relatively low molecular weight. The best results of all were attained with human albumin, of which the oncotic pressure is four times as high as that of blood. In several experiments the edema was not only reduced but removed altogether under the influence of human albumin. The author emphasizes, however, that to be effective the dosage should be much higher than has been given by most workers in the neurological and neurosurgical field. He suggests 4 c.c. per kilogram of human albumin or 10 c.c. per kilogram of dextran. To achieve a good clinical effect in cases of cerebral or other massive edema a single infusion of the colloidal solutions is not sufficient; rather a series of infusions should be given. Intravenous infusions of hypertonic glucose or saline solution are without any value and should be discontinued.

This interesting article should be studied in the original. —*Werner M. Solmitz, M.D.*